Southeast Bloomington Railroad Crossing and Transportation Study

September 16, 2011

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Executive Summary

The southeastern portion of the City of Bloomington is in need of an arterial street network and railroad crossings with the Norfolk Southern mainline in the area. Current economic conditions require that capital money needed for infrastructure projects be prioritized for improvements that provide the most benefit to the public. Any of the following potential improvements would allow continued growth in this portion of the City, but the goal of the study is to determine the best use of limited capital funding.

This study will recommend general alignments for arterial streets, prioritize the need for five proposed railroad crossings and arterial streets, provide recommendations for the type of railroad crossing (at-grade, over, or under), and conduct a preliminary review of the environmental conditions near the proposed improvements.

Prioritizing the location and need for particular roadway alignments and railroad crossings was completed using a series of objective tools. The following is a list and description of the tools used:

- A travel demand model was calibrated to existing travel patterns and used to determine effects of proposed street alternatives and railroad crossing types (at-grade, over, or under) on travel patterns and roadway capacity. Future growth and development projections and the Eastside Highway were taken into consideration by using 2035 socioeconomic conditions from those approved studies.
- Benefit-Cost analysis for expected travel time savings.
- Benefit-Cost analysis for predicted changes to crashes in the study area.
- Potential environmental impacts.
- Safety prediction.

Using the information provided throughout Section 3 of the report, capital funding for proposed infrastructure projects can be objectively prioritized in the following manner:

- Alternative #3 – Hershey Road (Morrissey to Hamilton) without a grade separation should be give first priority in the study area.
- Alternative #1 – Hamilton Road (Bunn to Commerce) without a grade separation should be given second highest priority in the study area.
- Alternative #4 – Hamilton Road (Hershey to Towanda Barnes) without a grade separation should be given third highest priority in the study area.
- Alternative #6 – Hamilton Road (Rhodes Lane Alignment) should be eliminated from funding consideration even though it remains south of the Norfolk Southern without crossing the railroad.
- Alternative #2 – Morrissey Drive (US 150) Grade Separation should be eliminated from funding consideration.
- Alternative #5 – Towanda Barnes Grade Separation should be eliminated from funding consideration.

1. Introduction

The southeastern portion of the City of Bloomington is need of an arterial street network and railroad crossings with the Norfolk Southern mainline in the area. Current economic conditions require that capital money needed for infrastructure projects be prioritized for improvements that provide the most benefit to the public. Any of potential improvements would allow continued growth in this portion of the City, but the goal of the study is to determine the best use of limited capital funding.

This study will recommend general alignments for arterial streets, prioritize the need for five proposed railroad crossings and arterial streets, provide recommendations for type of railroad crossing (at-grade, over, or under), and take a cursory look at the environmental conditions near the proposed improvements. The figures below depict the study area and general locations of the infrastructure improvements being studied.

Figure 1.1 – Study Area

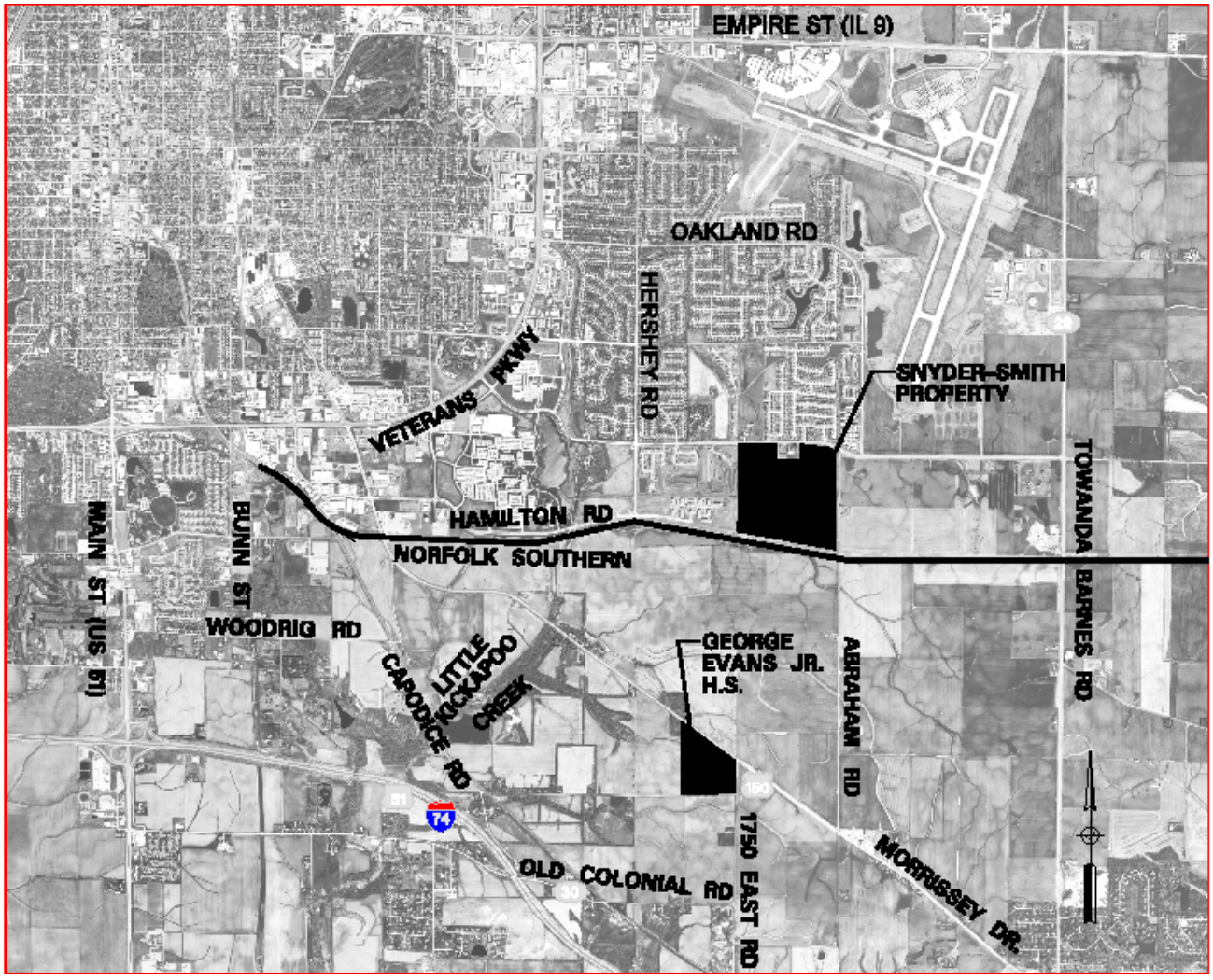


Figure 1.2 – Alternative Improvement Locations

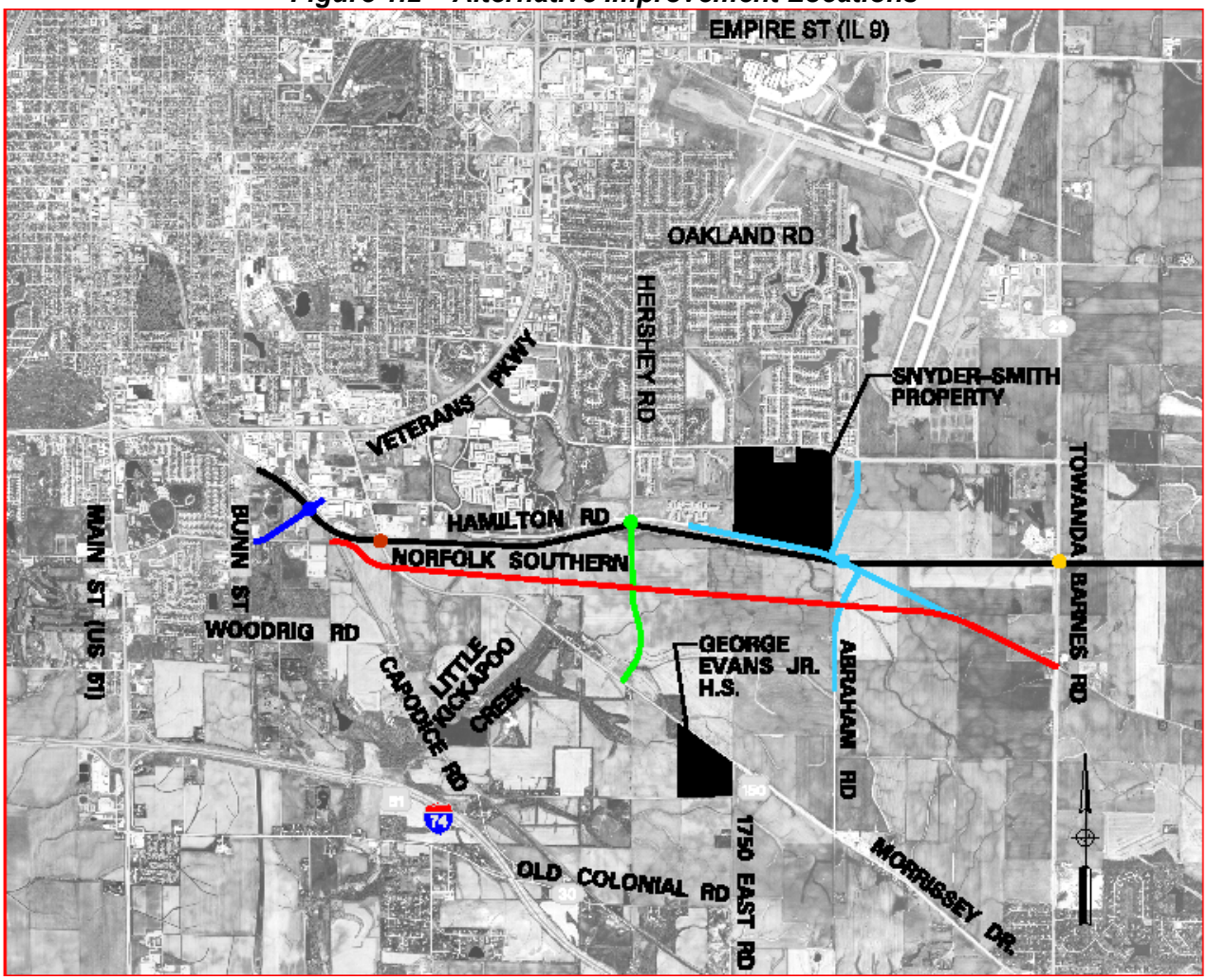


Table 1.1 is a summary and description of the alternatives shown in Figure 1.2.

Table 1.1 – Alternatives Description

Color	Alternative Number	Improvement	Description
Dark Blue	1	Hamilton Road	Bunn to Commerce
Dark Red Circle	2	Morrissey Drive (US 150)	Grade Separation
Green	3	Hershey Road	Morrissey to Hamilton
Light Blue	4	Hamilton Road	Hershey to Towanda Barnes
Yellow Circle	5	Towanda Barnes Road	Grade Separation
Red	6	Hamilton Road	Rhodes Lane Alignment

Prioritizing the location and need for particular roadway alignments and railroad crossings was completed using a series of objective tools. The following is a list and description of the tools used:

- A travel demand model was calibrated to existing travel patterns and used to determine effects of proposed street alternatives and railroad crossing types (at-grade, over, or under) on travel patterns and roadway capacity. Future growth and development projections and the Eastside Highway were taken into consideration by using 2035 socioeconomic conditions from those approved studies.
- Benefit-Cost analysis for expected travel time savings.
- Benefit-Cost analysis for predicted changes to crashes in the study area.
- Potential environmental impacts.
- Safety prediction.

2. Stakeholder Interviews

To better understand the needs of those that are using the existing street network and the impacts that potential infrastructure projects would have on use and travel patterns, a series of stakeholder interviews were conducted. Stakeholder interviews were conducted with State Farm, Snyder Companies, and Unit 5 administrative staff. The following is a summary of the information discussed and exchanged at each meeting.

2.1 State Farm Stakeholder Interview

A meeting took place at State Farm Corporate South on January 12, 2011, at 9 a.m. Those in attendance included Dave Rasmussen and Sheldon Blake from State Farm, Kevin Kothe and Ryan Otto from the City of Bloomington, and Cindy Loos and Kurt Bialobreski from Hanson Professional Services. The items discussed are included below.

The meeting opened with introductions and a description of the project by Kurt Bialobreski. State Farm presented a map of their facilities. In addition to their corporate properties, they also own farm property south of the Norfolk Southern Railroad and east of the Hershey Road extension. A discussion took place centered loosely on a series of questions presented by Hanson and the City.

State Farm expressed the following opinions about the projects. Rhodes Lane has a high volume of traffic on a bad roadway. The Hamilton Road: Bunn to Commerce extension and overpass would be key to State Farm operations because of the Research, Flex I, and Flex II facilities off of Rhodes Lane. This extension would also benefit pedestrian traffic across the tracks while providing access to State Farm Park. Additionally, it would provide connection for Constitution Trail. Hershey Road: Hamilton to Morrissey extension would relieve Morrissey (US 150) and have the largest impact on traffic patterns in the area if it is extended to US 150. The City and Hanson expressed concern that extending Hershey Road to US 150 may increase the traffic volume using the road, and it is currently over capacity in sections.

State Farm also noted that a new Ameren power line is being proposed to run parallel to the NS alignment. In addition, if overpasses are determined to be beneficial, State Farm has fill available nearby; however, it would need to be dried.

State Farm also stated the following general observations.

- Most people from the north use Veterans Drive and Ireland Grove Road to access State Farm.
- 20-50 bicycles and 100-130 motorcycles are used for commuting daily by employees.

2.2 Snyder Companies Stakeholder Interview

A meeting took place at the Snyder Properties office on January 12, 2011, at 11 a.m. Those in attendance included Steve Snyder, Ron Powell, Dave Fedor, and David Stanczyk from Snyder Companies, Kevin Kothe and Ryan Otto from the City of Bloomington, and Cindy Loos and Kurt Bialobreski from Hanson Professional Services. The items discussed are included below.

The meeting opened with introductions and a description of the project by Kurt Bialobreski. Discussion was then centered loosely on a series of questions presented by Hanson and the City.

Snyder Properties stated that the multifamily residential market is growing quickly at this time. In addition, commercial development will likely happen prior to any increase in the single family housing market.

Snyder Properties recently purchased 160 acres (Smith Property) bounded by the railroad, Abram Road, Ireland Grove Road, and their previous development in the southeast quadrant of the Hershey Road and Ireland Grove Road intersection. Current plans for this area include big box commercial near the Abram Road and Ireland Grove Road intersection and an extension of the current multifamily and single family development in their adjoining property. This matches the current zoning map for the area. Snyder offered the following general comments:

- The connection of Hamilton Road to Main Street was a big help to improving east-west movement through the study area.
- There are no current plans for additional development in the Fox Creek area.

Snyder Properties currently owns 28 acres south of the railroad tracks and plans for that property to be multifamily residential with 200 to 250 units that could be built as soon as the Hershey Road extension is completed. Snyder would rank completing the Hershey Road: Morrissey to Hamilton extension is their highest infrastructure priority in the study area due to its likely creation of a heavily traveled intersection at Hershey Road and Hamilton Road. The Hamilton Road: Hershey to Towanda Barnes extension is their number two priority as it would increase the viability of commercial development on the Smith Property.

2.3 Unit 5 Stakeholder Interview

A meeting took place at the Unit 5 District office on January 12, 2011, at 1 p.m. Those in attendance included Dr. Gary Niehaus, Jeff Monahan, and Joe Addlemen from Unit 5, Neil Finlen from Farnsworth Group, Ryan Otto from the City of Bloomington, and Cindy Loos and Kurt Bialobreski from Hanson Professional Services. The items discussed are included below.

The meeting opened with introductions and a description of the project by Kurt Bialobreski. Discussion was then centered loosely on a series of questions presented by Hanson and the City. Farnsworth Group provided a parcel map of the area surrounding the Junior High School, an intersection design study for US 150 and Hershey Road (extended), preliminary plans for the Hershey Road Extension, and correspondence they have had with the Norfolk Southern Railroad.

The new Junior High School on US 150 is roughly located at the intersection of Hershey (extended) and US 150. There is a traffic signal at the intersection of US 150 and the Junior High School. This Junior High School will have 800 students with a capacity of 1200. Approximately 60% of the students ride the bus to school and 40% will be dropped off by adults. A proposed High School is most likely to be built on the neighboring Shirk property in 2015/2016. If that becomes unfeasible, the location may be moved to the nearby Capodice property. Another additional school and location is being investigated at the intersection of Towanda Barnes Road and GE Road, near the existing Barnes Elevator.

A 24” water main and 20” sewer main run down the proposed Hershey Road right-of-way to the school sites.

Unit 5 stated that new elementary schools planned for the study area are Benjamin and Cedar Ridge.

Unit 5 stated that improving the intersection of US 51 and Woodrig Road and improving Woodrig Road to its connection to US 150 would be helpful to their operations. Of the infrastructure improvements shown on the study area map provided by Hanson and the City, Unit 5 said that the Hershey Road: Hamilton to Morrissey extension was a priority and important for life safety reasons. Additionally, the completion of Hamilton Road: Bunn to Commerce and its crossing are important for moving students east-west from the Fox Creek area to the new Junior High School on US 150 and relieving the traffic volumes on substandard Rhodes Lane. If rating the importance of these two improvements, Unit 5 would rate the Hershey Road: Hamilton to Morrissey extension slightly ahead of the Hamilton Road: Bunn to Commerce connection.

Unit 5 asked if there was any information regarding Ameren’s planned location for the new power lines in the south east portion of the study area. The City stated that State Farm said that at this time the line is expected to head south from the substation on Towanda Barnes Road and then turn west towards the Norfolk Southern Railroad alignment, but a specific location has not been provided to date.

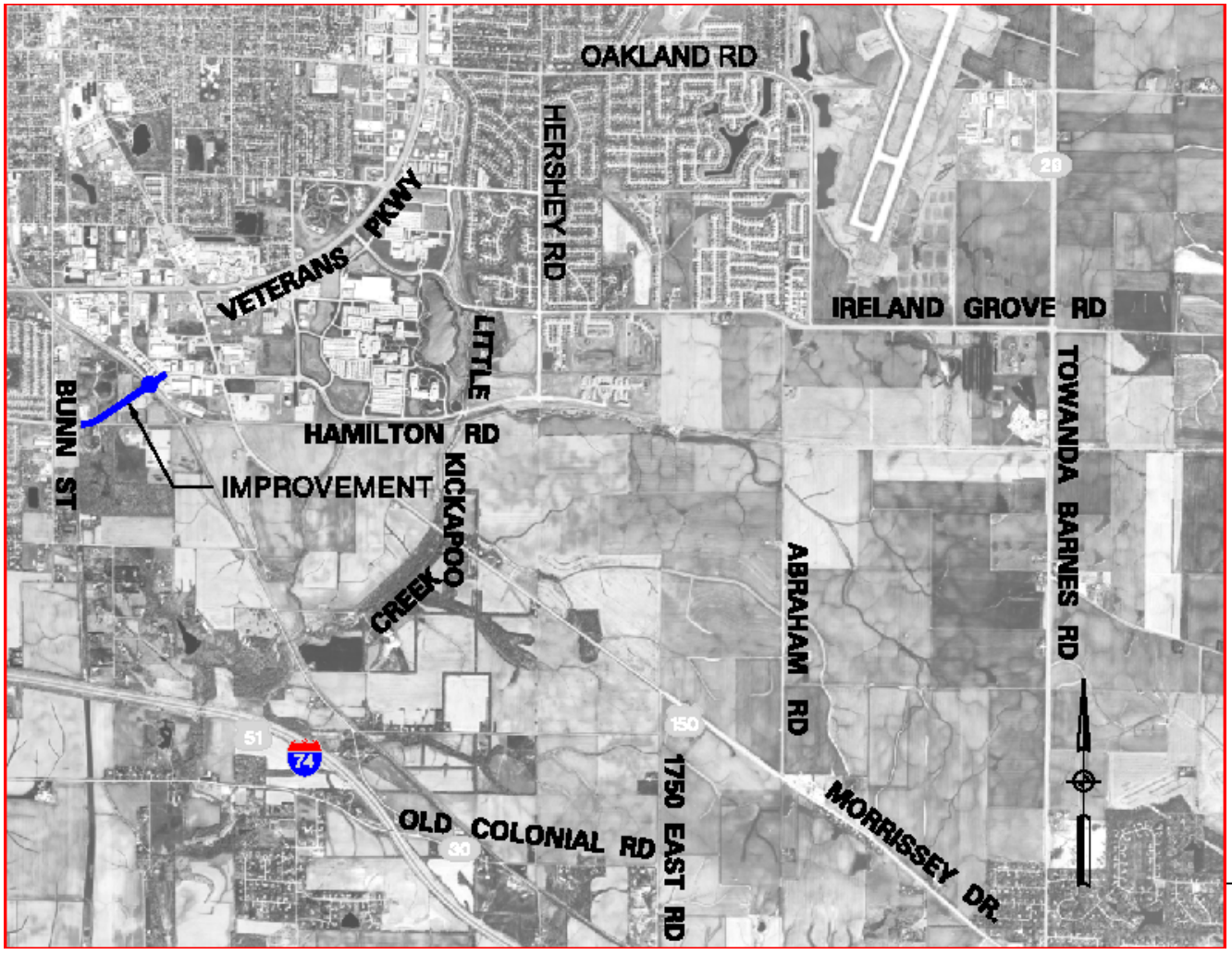
3. Alternatives and Street Networks

The purpose of this section of the report is to analyze each alternative to determine the effects the alternative has on existing and future travel demands in southeastern Bloomington, the possible impacts the alternative may have on the surrounding environment, the safety benefits of each alternative, and a quantitative comparison of the alternatives.

3.1 Alternative #1 – Hamilton Road: Bunn to Commerce

Alternative #1 consists of constructing Hamilton Road from Bunn Street to Commerce Drive. Constructing this improvement provides a continuous east-west arterial street from west of Veterans Parkway (I-55 Business) to Hershey Road. Constructing this improvement would require the crossing of a series of Norfolk Southern railroad tracks. A portion of these railroad tracks are storage tracks that would be required to be relocated to a site near the Mitsubishi auto plant if this segment of Hamilton Road is constructed. Because this improvement requires crossing the Norfolk Southern Railway, at-grade and grade separated crossing alternatives were considered in the following analysis. See Figure 3.1.1 for a graphical description of this alternative.

Figure 3.1.1 – Alternative #1 – Hamilton Road: Bunn to Commerce



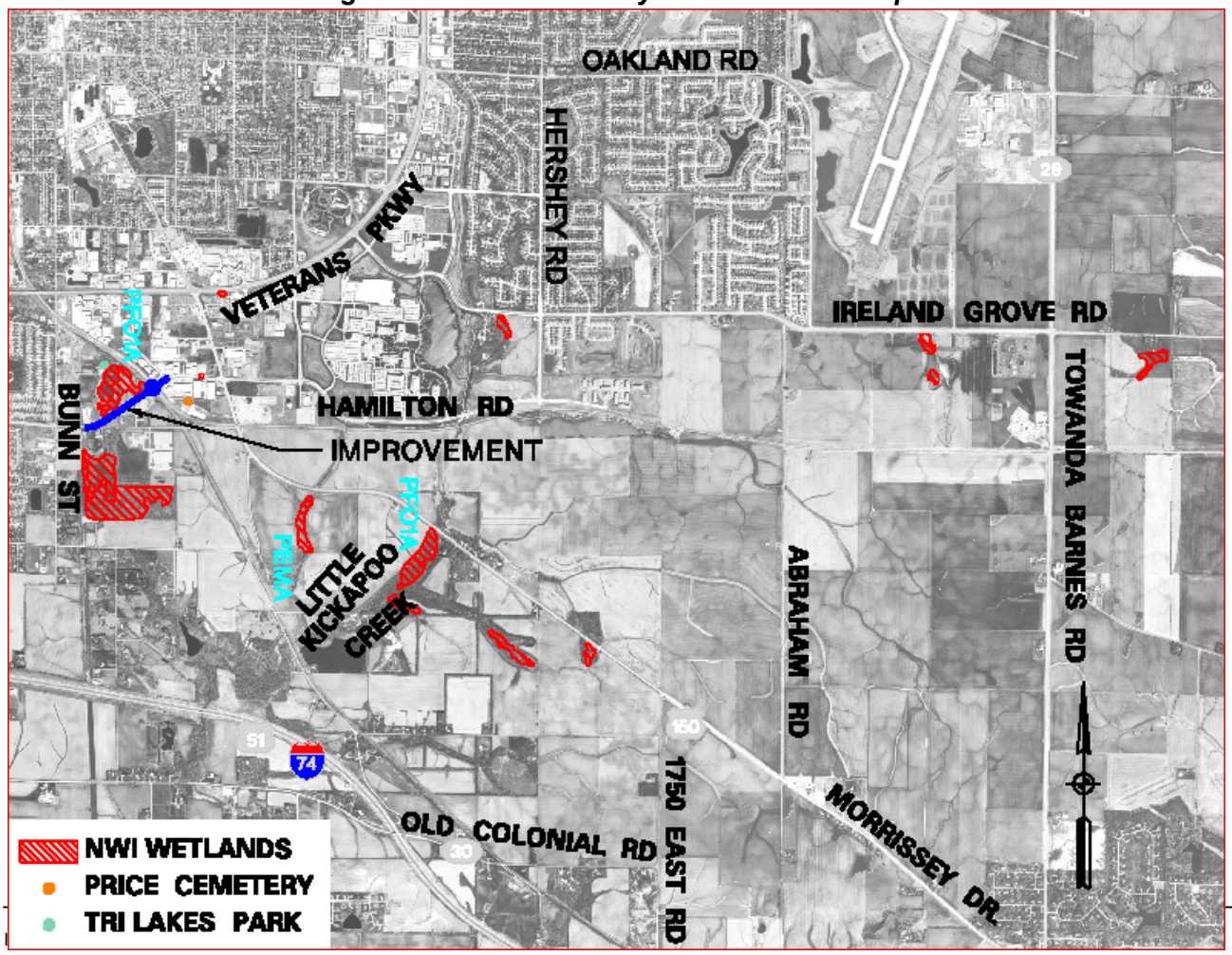
3.1.1 Environmental

A preliminary environmental inventory was conducted for Alternative #1 (Hamilton Road: Bunn Street to Commerce Drive). A site visit, research of databases, and research of available aerial mapping were completed to determine possible environmental impacts that could inhibit or delay construction of this alternative. Considerations were given to impacts associated with:

- Agricultural Land,
- Parks and Recreation Areas,
- Surface Water Resources,
- Wetlands,
- Cultural Resources,
- Special Waste, and
- Threatened and Endangered Species/Natural Resources.

The analysis determined that this alternative may cause National Wetland Inventory (NWI) mapped wetland impacts, commercial relocations and some traffic disturbance. Figure 3.1.2 maps the preliminary known impacts of the alternative.

Figure 3.1.2 – Preliminary Environmental Impacts



3.1.2 Safety

The safety benefit-cost analysis compares the costs associated with the number of fatalities and injuries predicted to occur at an at-grade railroad crossing versus the cost of constructing a grade separation with zero fatalities and injuries from crashes between trains and vehicles. If the safety benefit-cost ratio was calculated to be less than 0.50, then the safety benefits of the improvement were considered insignificant.

The following steps were used to calculate the costs associated with predicted fatalities and injuries for each alternative.

- The number of crashes expected at each at-grade railroad crossing was predicted using a formula from "Assessment of Risks for High-Speed Rail Grade Crossings on the Empire Corridor" published in August 2000 by the U.S. Department of Transportation (USDOT) Federal Railroad Administration (FRA).
- The Federal Transit Administration's (FTA) State Safety Oversight program estimates that 0.25 fatalities occur per crash.
- Combining data from the USDOT FRA and FTA State Safety Oversight program, an estimated 0.50 injuries occur per crash.
- The cost of $3.76 million was assigned to expected fatalities per the Illinois Department of Transportation Safety Policy 1-06.
- The cost of $188,000 was assigned to expected injuries per the Illinois Department of Transportation Safety Policy 1-06.
- The number of expected yearly crashes was multiplied by twenty-five years to compensate for the design life of an at-grade crossing that would be constructed.

These steps resulted in the benefit-cost ratio shown in Table 3.1.1.

Table 3.1.1 - Safety Benefit-Cost Ratio

	Fatalities/year	Injuries/year	Crash Costs	*Grade Separation and RR Relocation Cost	Benefit/Cost
Alternative #1	0.028	0.056	$2,904,038	$13,800,000	0.21

*Grade separation costs include grade separation structure and all appurtent improvements for $9.3 million and $4.5 million to relocate storage tracks. Both improvements were assumed to be required in order to reduce grade separation structure costs.

Additional safety benefits for Alternative #1 (Hamilton: Bunn to Commerce) include cul-de-sacing Rhodes Lane at the intersection with Morrissey Drive (US 150). The safety benefits of this improvement include the removal of an intersection near an at-grade crossing and the removal of through traffic from Rhodes Lane (substandard design and pavement conditions).

3.1.3 Travel Demand Model

The Travel Demand Model (TDM) was used as a tool to forecast existing and future travel demands throughout the southeastern portion of the City of Bloomington. After the model was calibrated to existing conditions, future alternatives were tested to determine if changes to the travel patterns adversely affect or enhance mobility for neighborhoods, businesses, and those traveling through the study area. The existing network was altered to reflect the changes caused by the proposed improvement alternative.

Four (4) TDM scenarios were completed to determine the effects that this alternative would have on the travel patterns and roadway congestion of the street network. Alternative #1 (Hamilton: Bunn to Commerce) was analyzed with existing 2010 socioeconomic data and 2035 socioeconomic data assuming that the Eastern Bypass is fully constructed. The following TDM scenarios were completed with the 2010 and 2035 socioeconomic data:

- Existing Street Network without Alternative #1 (2010 socioeconomic data),
- Existing Street Network without Alternative #1 (2035 socioeconomic data),
- Existing Street Network with Alternative #1 and with an at-grade crossing of the Norfolk Southern (2035 socioeconomic data), and
- Existing Network with Alternative #1 and a grade separated crossing of the Norfolk Southern (2035 socioeconomic data).

Using the TDM, the amount of time needed to travel through the study area via each entry and exit location was calculated for each network used to evaluate Alternative #1 (Hamilton: Bunn to Commerce). The results of this analysis are shown in Table 3.1.2

Table 3.1.2 – Network Travel Time

TDM Network Scenario	Travel Time (Minutes)	% Difference*
Existing 2010	5202.55	-
Existing 2035	5755.13	10.62%
Alternative #1 2035 (At-Grade Crossing)	5601.96	7.68%
Alternative #1 2035 (Grade Separated Crossing)	5601.96	7.68%

*From Existing 2010

The analysis for the at-grade and grade separate railroad crossing networks takes into account delays from current daily train traffic (5 trains per day), and up to ten times the existing volume. The Norfolk Southern was contacted regarding potential future daily train traffic volumes on this track. At this time, the Norfolk Southern does not have any projections for future daily train traffic volumes on this track. Analysis of the travel times for the street networks shows that there is not much time savings for vehicles traveling the street network if the grade separated structure is constructed.

Given that Table 3.1.2 shows a marginal benefit to travel time estimates from constructing a grade separation and Table 3.1.1 provides a Benefit/Cost ratio of less than one, it is

recommended that constructing a grade separated crossing with this alternative be eliminated from further analysis.

Relative changes between the Existing 2035 average daily traffic (ADT) and the ADT of either Alternative #1 network are provided in Table 3.1.2. An increase in projected traffic volume for a particular roadway would decrease that roadway's service life, and conversely, a decrease in the projected traffic volume would increase the roadway's service life; thus allowing only maintenance to be required for a longer time frame. Increases or decreases of approximately 10% are noted in Table 3.1.3. Other significant roadways are also provided for background information.

Table 3.1.3 – 2035 ADT Changes

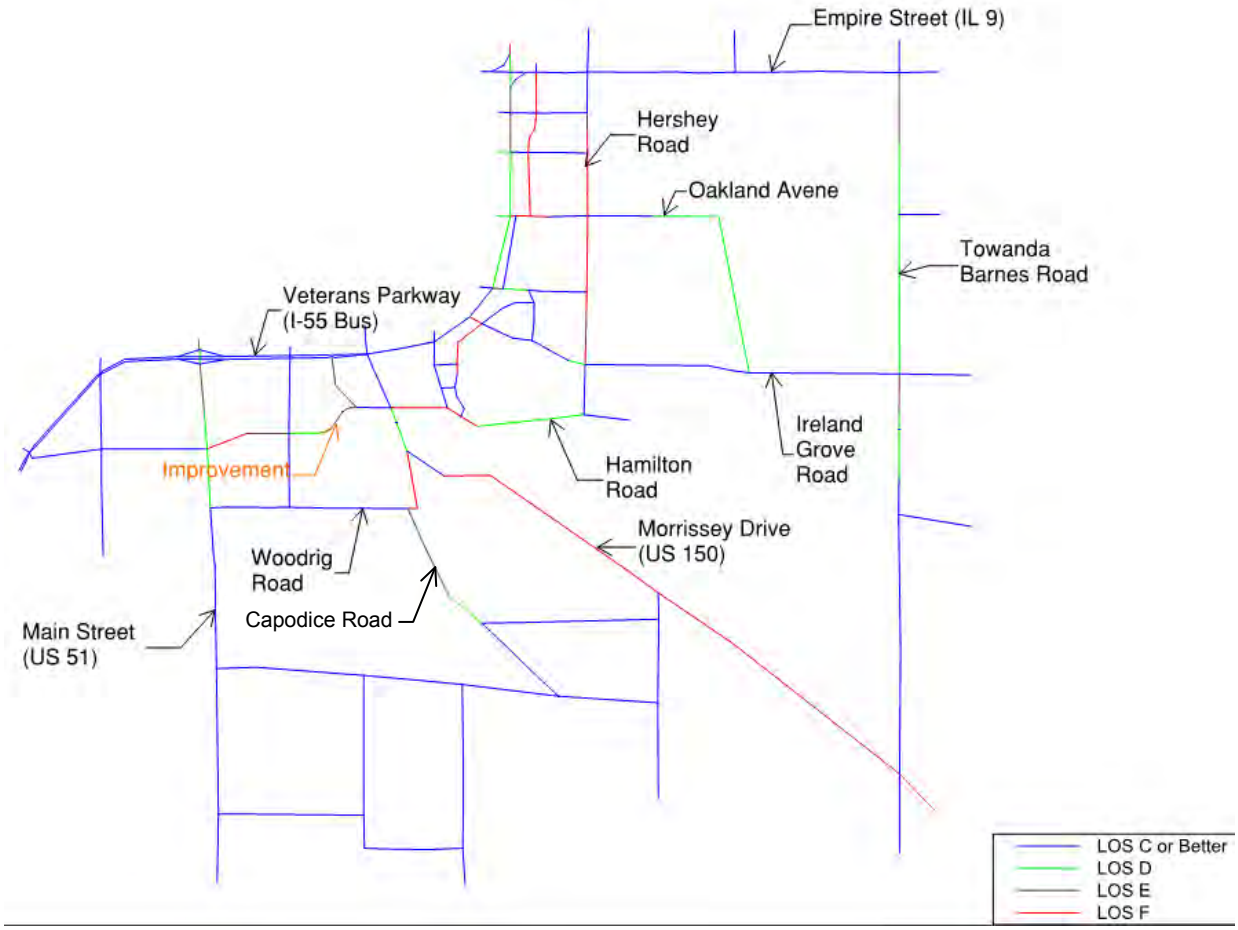
Roadway Segment	2035 No Build TDM ADT	2035 Hamilton: Bunn – Commerce TDM ADT	Alternative v/c Ratio	LOS	% Change
Hershey (North of Oakland)	39,370	35,985	1.20	F	-8.6%
Hamilton (Morrissey to Loop)	27,099	27,405	1.10	F	1.1%
Morrissey (North of Hamilton)	23,338	21,150	0.71	C	-9.4%
Ireland Grove Road (East of Stried)	23,292	20,953	0.69	B	-10.0%
IL 9 (East of Hershey)	36,868	32,486	0.59	B	-11.9%
Woodrig Road	3,891	7,227	0.58	B	85.7%
Veterans Pkwy (East of Morrissey)	57,515	59,009	0.71	C	2.6%
Veterans Pkwy (West of Morrissey)	46,871	51,145	0.63	B	9.1%

For the 2035 condition, the roadway segment Level of Service (LOS) has been calculated for all street segments. A level-of-service (LOS) is a grading system whereby the quality of operation on a street system can be identified. LOS's range from an "A", the best traffic operation, to "F", the poorest. The LOS for roadways can be based on a ratio of the volume to total capacity (v/c) for a 24 hour period. It is generally accepted that for urbanized areas the minimum acceptable LOS is Level D. Table 3.1.4 describes LOS and the relationship to v/c ratio. For the purposes of analyzing this alternative, the LOS for streets in the study area are identified in Figure 3.1.3.

Table 3.1.4 - LOS Description

LOS	*Description*	*Volume to Capacity Ratio*
A	Free flowing traffic	< 0.50
B	Low-density stable traffic	0.51 – 0.70
C	Medium density stable traffic flow	0.71-0.80
D	High density stable traffic flow	0.81-0.90
E	Unstable flow at or near capacity levels	0.91-1.0
F	Breakdown of traffic flow	> 1.0

Figure 3.1.3 – Street LOS



3.1.4 Travel Demand Model Findings

Using Table 3.1.3 and Figure 3.1.3, the following conclusions can be made regarding traffic patterns and operations caused by implementing Alternative #1 (Hamilton Road: Bunn to Commerce):

- The service life of Veterans Parkway (I-55 Bus), Ireland Grove Road, and Empire Street (IL 9) is extended by approximately 10%.
- Hamilton Road, between Main Street (US 51) and Hershey Road provides a much needed east-west arterial roadway evident by the roadway reaching the calculated capacity within the planning horizon (2035).
- Constructing Hamilton Road (Bunn to Commerce) does not alleviate congestion on Hershey Road or Morrissey Drive (US 150) enough to keep either roadway from failing.
- Woodrig Road and Capodice Road see dramatic increases in traffic volumes because land development to the south and west use these roadways to reach Morrissey Drive and Hamilton Road (east of Morrissey Drive) since Hamilton Road (east of Main Street) and Main Street are

reaching capacity. These roadways will likely need to be reconstructed to accommodate the trips if this land development occurs.

3.1.5 Travel Time Benefit-Cost Analysis

Because travel time changes based on the improvement constructed, a benefit-cost ratio was calculated for Alternative #1 (Hamilton: Bunn to Commerce). A travel time benefit-cost ratio was not calculated for the grade separation alternative because the TDM analysis showed that traffic volumes and travel times were not greatly affected by constructing this improvement.

A breakdown of the costs for Alternative #1 is shown in Table 3.1.5. These costs result in the benefit-cost ratio shown in Table 3.1.6. The cost to relocate the Norfolk Southern storage tracks was estimated at $4.5 million in 2011 dollars and would be subject to negotiation with Norfolk Southern while working towards obtaining an ICC railroad crossing order.

Table 3.1.5 – Alternative #1 (Hamilton: Bunn to Commerce) Opinion of Probable Cost

Item	Opinion of Probable Cost
Construction	$5,400,000
RR Relocation	$4,500,000
Right-of-Way	$660,000
Engineering	$1,080,000
TOTAL	**$11,640,000**

Table 3.1.6 - Travel Time Benefit-Cost Ratio

	Benefit	Cost	Benefit/Cost
Alternative #1	$666,039,322	$11,640,000	57.22

The following steps were used to estimate the cost to construct Alternative #1.

- The length of the roadway proposed to be constructed was multiplied by the number of travel lanes required for adequate capacity by the TDM ADT estimates. In this case, the improvement is a 3 lane section for an ADT predicted to be approximately 14,000.
- A unit cost of $500/foot/lane was multiplied by the previous product.
- The cost of relocating the storage tracks is $4.5 million.
- The cost of right-of-way needed for the project is $60,000 per acre in urban areas and $20,000 per acre for rural areas. This alternative will require acquisition of approximately 11 acres in an urban area.
- The cost of design and construction engineering was assumed to be 20% of the construction cost.

The following steps were used to calculate the travel time benefit per year for each alternative.

- The TDM calculated the time it takes to travel to and from each external station in the study area for the 2035 socioeconomic condition (Table 3.1.1).
- The calculated travel time for the alternative was subtracted from the calculated Existing 2035 travel time (Table 3.1.1).
- The difference in travel time was then multiplied by the ADT across the busiest link in the 2035 No Build alternative (71,480) and 365 days per year.
- An average wage of $10/hour was multiplied by the previous product.

3.2 Alternative #2 – Morrissey Drive (US 150) Grade Separation

Alternative #2 consists of constructing a grade separation between Morrissey Drive (US 150) and the Norfolk Southern Railroad tracks. Constructing this improvement likely eliminates the railroad conflict from the intersection of Rhodes Lane and Morrissey. Because this improvement requires crossing the Norfolk Southern Railway, the existing network and a grade separated crossing alternative were considered in the following analysis. See Figure 3.2.1 for a graphical description of this alternative.

Figure 3.2.1 – Alternative #2 – Morrissey Drive (US 150) Grade Separation

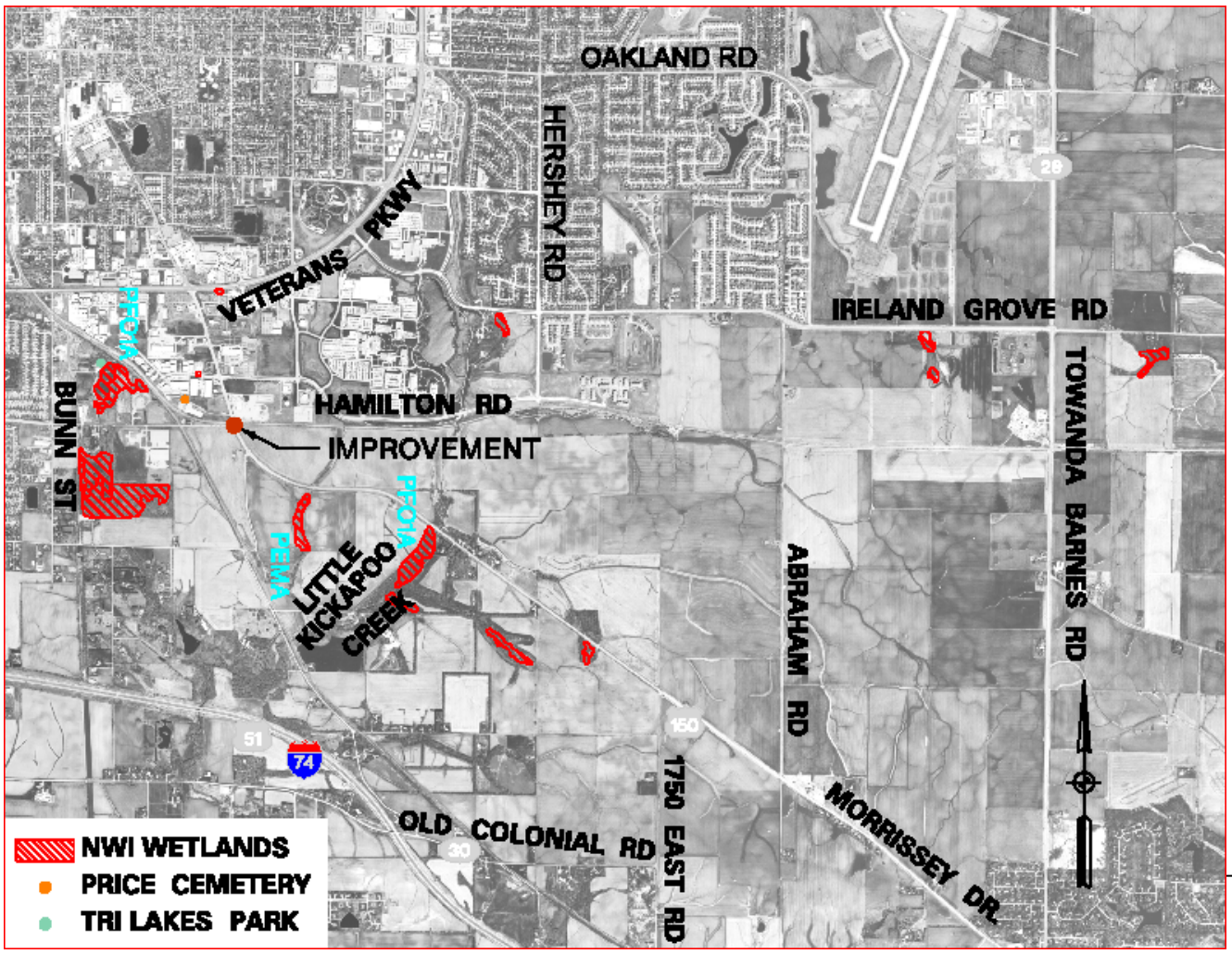
3.2.1 Environmental

A preliminary environmental inventory was conducted for Alternative #2 (Morrissey Drive Grade Separation). A site visit, research of databases, and research of available aerial mapping were completed to determine possible environmental impacts that could inhibit or delay construction of this alternative. Considerations were given to impacts associated with:

- Agricultural Land,
- Parks and Recreation Areas,
- Surface Water Resources,
- Wetlands,
- Cultural Resources,
- Special Waste, and
- Threatened and Endangered Species/Natural Resources.

The analysis determined that this alternative could possibly require no relocations, no NWI mapped wetland impacts, and some traffic disturbance. Figure 3.2.2 maps the preliminary known impacts of the alternative.

Figure 3.2.2 – Preliminary Environmental Impacts



3.2.2 Safety

The safety benefit-cost analysis compares the costs associated with the number of fatalities and injuries predicted to occur at an at-grade railroad crossing versus the cost of constructing a grade separation with zero fatalities and injuries from crashes between trains and vehicles. If the safety benefit-cost ratio was calculated to be less than 0.50, then the safety benefits of the improvement were considered insignificant.

The following steps were used to calculate the costs associated with predicted fatalities and injuries for each alternative.

- The number of crashes expected at each at-grade railroad crossing was predicted using a formula from "Assessment of Risks for High-Speed Rail Grade Crossings on the Empire Corridor" published in August 2000 by the U.S. Department of Transportation (USDOT) Federal Railroad Administration (FRA).
- The Federal Transit Administration's (FTA) State Safety Oversight program estimates that 0.25 fatalities occur per crash.
- Combining data from the USDOT FRA and FTA State Safety Oversight program, an estimated 0.50 injuries occur per crash.
- The cost of $3.76 million was assigned to expected fatalities per the Illinois Department of Transportation Safety Policy 1-06.
- The cost of $188,000 was assigned to expected injuries per the Illinois Department of Transportation Safety Policy 1-06.
- The number of expected yearly crashes was multiplied by twenty-five years to compensate for the design life of an at-grade crossing that would be constructed.

These steps resulted in the benefit-cost ratio shown in Table 3.2.1.

Table 3.2.1 - Safety Benefit-Cost Ratio

	Fatalities/year	Injuries/year	Crash Costs	*Grade Separation	Benefit/Cost
Alternative #2	0.017	0.033	$1,715,245	$9,300,000	0.18

*Grade separation costs include grade separation structure and all appurtent improvements

Additional safety benefits for Alternative #2 (Morrissey Drive Grade Separation) includes removing the railroad track traffic conflict from the intersection of Rhodes Lane at Morrissey Drive (US 150). However, steep approach grades caused by the Morrissey Drive grade separation could increase the likelihood of crashes at the intersection of Rhodes Lane and Morrissey Drive.

3.2.3 Travel Demand Model

The Travel Demand Model (TDM) was used as a tool to forecast existing and future travel demands throughout the southeastern portion of the City of Bloomington. After the model was calibrated to

existing conditions, future alternatives were tested to determine if changes to the travel patterns adversely affect or enhance mobility for neighborhoods, businesses, and those traveling through the study area. The existing network was altered to reflect the changes caused by the proposed improvement alternative.

Three (3) TDM scenarios were completed to determine the effects that this alternative would have on the travel patterns and roadway congestion of the street network. Alternative #2 (Morrissey Drive (US 150) Grade Separation) was analyzed with existing 2010 socioeconomic data and 2035 socioeconomic data assuming that the Eastern Bypass is fully constructed. The following TDM scenarios were completed with the 2010 and 2035 socioeconomic data:

- Existing Street Network without Alternative #2 (2010 socioeconomic data),
- Existing Street Network without Alternative #2 (2035 socioeconomic data), and
- Existing Network with Alternative #2 and a grade separated crossing of the Norfolk Southern (2035 socioeconomic data).

Using the TDM, the amount of time needed to travel through the study area via each entry and exit location was calculated for each network used to evaluate Alternative #2 (Morrissey Drive (US 150) Grade Separation). The results of this analysis are shown in Table 3.2.2

Table 3.2.2 – Network Travel Time

TDM Network Scenario	Travel Time (Minutes)	% Difference*
Existing 2010	5202.55	-
Existing 2035	5755.13	10.62%
Alternative #2 2035 (Grade Separated Crossing)	5695.52	9.48%

*From Existing 2010

The analysis for the at-grade and grade separate railroad crossing networks takes into account delays from current daily train traffic (5 trains per day), and up to ten times the existing volume. The Norfolk Southern was contacted regarding potential future daily train traffic volumes on this track. At this time, the Norfolk Southern does not have any projections for future daily train traffic volumes on this track. Analysis of the travel times for the street networks shows that there is a 1.14% travel time savings across the entire 2035 street network if Morrissey Drive Grade Separation is constructed. It should be noted that this travel time savings is not significant when compared to other alternatives studied.

Given that Table 3.2.2 shows a marginal benefit to travel time estimates, compared to other alternatives, from constructing a grade separation and Table 3.2.1 provides a Safety benefit-cost ratio of less than one, it is recommended that constructing this grade separated crossing alternative be eliminated from further analysis.

Further analysis using the TDM was not completed because travel times, levels-of-service, and travel patterns were not significantly changed from Existing 2035 network conditions by implementing the Morrissey Drive Grade Separation.

3.2.4 Travel Time Benefit-Cost Analysis

Because there is a slight improvement in travel time if the improvement is constructed, a benefit-cost ratio was calculated for Alternative #2 (Morrissey Drive Grade Separation).

Costs for this grade separation alternative, with roadway over or under the railroad, were considered using the following design criteria:

- Vertical clearance over roadway – 17 ft
- Vertical clearance over railroad – 23 ft
- Roadway Width – 60 ft (4~12 ft lanes, 2~6 ft shoulders)
- Roadway improvement length is 1600 feet
- Roadway grades – maximum 5%

At the existing crossing on Morrissey Drive (US 150), no major buildings are close to the crossing. However, the crossing is on a skew, so structure cost will be somewhat increased. Both overpass and underpass options are possible at this location. However, Rhodes Lane would need to be realigned to tie into US 150 outside the limits of the structure.

A breakdown of the costs for Alternative #2 is shown in Table 3.2.3. These costs result in the benefit-cost ratio shown in Table 3.2.4.

Table 3.2.3 – Alternative #2 (Morrissey Drive Grade Separation) Opinion of Probable Cost

Item	Opinion of Probable Cost
Construction	$9,300,000
Right-of-Way	$300,000
Engineering	$1,860,000
TOTAL	**$11,460,000**

Table 3.2.4 - Travel Time Benefit-Cost Ratio

	Benefit	Cost	Benefit/Cost
Alternative #2	$259,206,137	$11,460,000	22.62

The following steps were used to estimate the cost to construct Alternative #2.

- The roadway and bridge assumptions are given above.
- The cost of right-of-way needed for the project is $60,000 per acre in urban areas and $20,000 per acre for rural areas. This alternative will require acquisition of approximately 5 acres, all of which was assumed to be acquired at the urban area unit cost.
- The cost of design and construction engineering was assumed to be 20% of the construction cost.

The following steps were used to calculate the travel time benefit for each alternative.

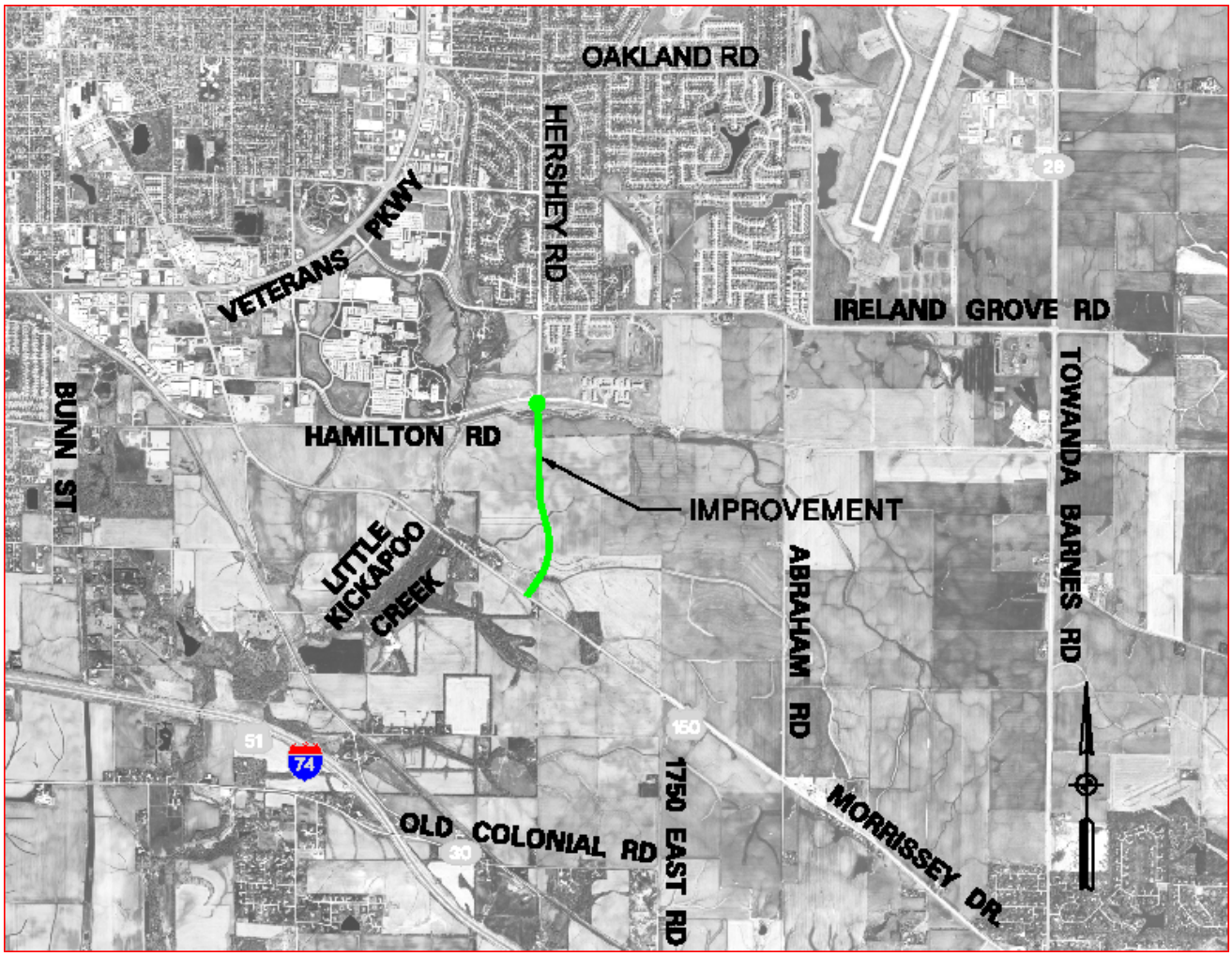
- The TDM calculated the time it takes to travel to and from each external station in the study area for the 2035 socioeconomic condition (Table 3.2.1).
- The calculated travel time for the alternative was subtracted from the calculated Existing 2035 travel time (Table 3.2.1).
- The difference in travel time was then multiplied by the ADT across the busiest link in the 2035 No Build alternative (71,480) and 365 days per year.
- An average wage of $10/hour was multiplied by the previous product.

The calculated benefit-cost ratio is low compared to other alternatives, which provides further evidence that Alternative #2 – Morrissey Drive Grade Separation should not be carried forward to construction.

3.3 Alternative #3 – Hershey Road: Morrissey to Hamilton

Alternative #3 consists of constructing Hershey Road from Morrissey Drive (US 150) to Hamilton Road and a new grade crossing at Hersey Road and the Norfolk Southern Railroad tracks, just south of the intersection of Hershey Road and Hamilton Road. Constructing this improvement provides a continuous north-south arterial street from Empire Street (IL 9) to Morrissey Drive (US 150). Constructing Hershey Road to 750 feet south of the Norfolk Southern railroad tracks does not add any benefit to the overall transportation system, and therefore, was not considered as an alternative. Because this improvement requires crossing the Norfolk Southern Railway, at-grade and grade separated crossing alternatives were considered in the following analysis. See Figure 3.3.1 for a graphical description of this alternative.

Figure 3.3.1 – Alternative #3 – Hershey Road: Morrissey to Hamilton



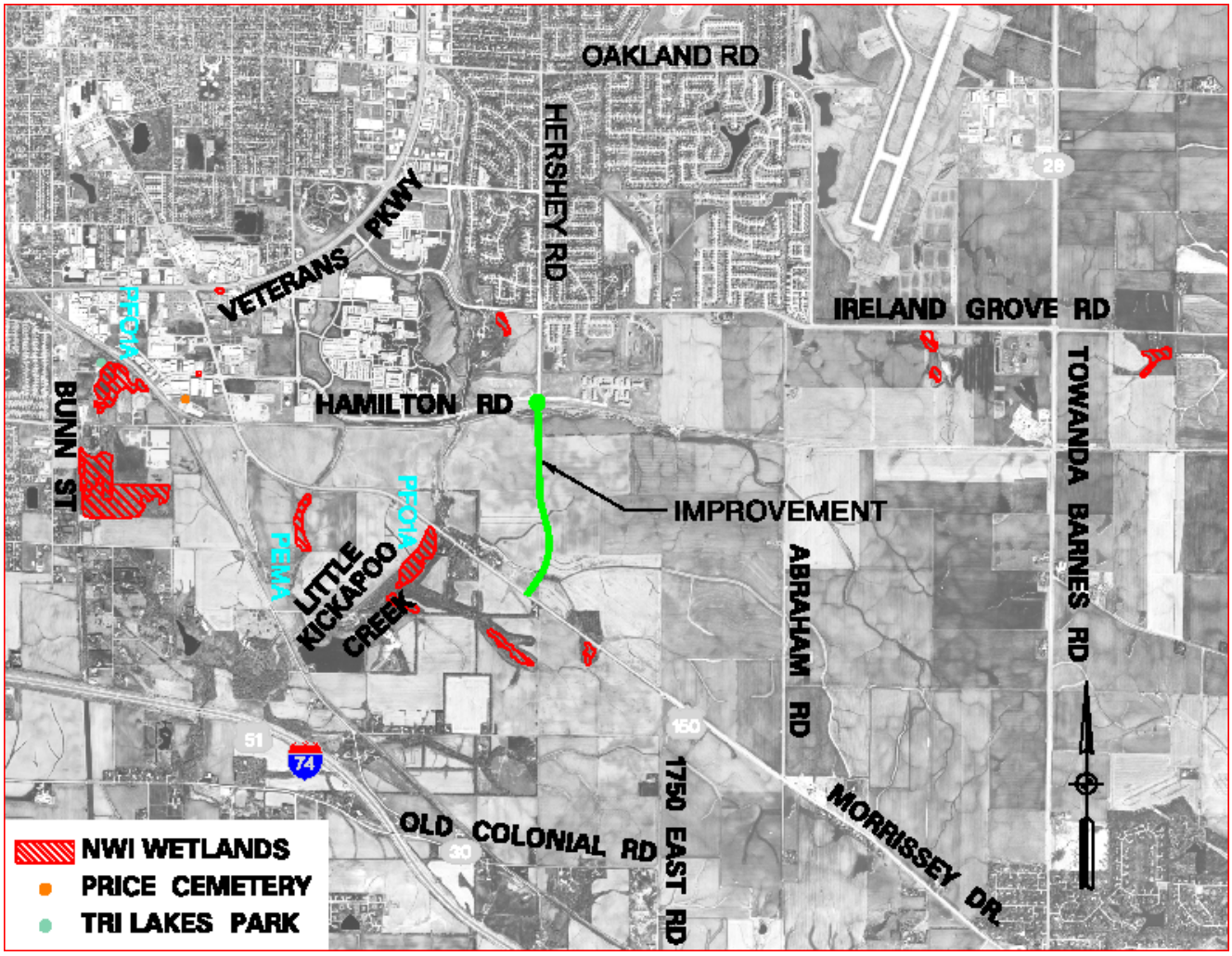
3.3.1 Environmental

A preliminary environmental inventory was conducted for Alternative #3 (Hershey Road: Morrissey to Hamilton). A site visit, research of databases, and research of available aerial mapping were completed to determine possible environmental impacts that could inhibit or delay construction of this alternative. Considerations were given to impacts associated with:

- Agricultural Land,
- Parks and Recreation Areas,
- Surface Water Resources,
- Wetlands,
- Cultural Resources,
- Special Waste, and
- Threatened and Endangered Species/Natural Resources.

The analysis determined that this alternative will require water of the United States impacts at the crossing of the Little Kickapoo Creek, no relocations, and some traffic disturbance. Figure 3.3.2 maps the preliminary known impacts of the alternative.

Figure 3.3.2 – Preliminary Environmental Impacts



3.3.2 Safety

The safety benefit-cost analysis compares the costs associated with the number of fatalities and injuries predicted to occur at an at-grade railroad crossing versus the cost of constructing a grade separation with zero fatalities and injuries from crashes between trains and vehicles. If the safety benefit-cost ratio was calculated to be less than 0.50, then the safety benefits of the improvement were considered insignificant.

The following steps were used to calculate the costs associated with predicted fatalities and injuries for each alternative.

- The number of crashes expected at each at-grade railroad crossing was predicted using a formula from "Assessment of Risks for High-Speed Rail Grade Crossings on the Empire Corridor" published in August 2000 by the U.S. Department of Transportation (USDOT) Federal Railroad Administration (FRA).
- The Federal Transit Administration's (FTA) State Safety Oversight program estimates that 0.25 fatalities occur per crash.
- Combining data from the USDOT FRA and FTA State Safety Oversight program, an estimated 0.50 injuries occur per crash.
- The cost of $3.76 million was assigned to expected fatalities per the Illinois Department of Transportation Safety Policy 1-06.
- The cost of $188,000 was assigned to expected injuries per the Illinois Department of Transportation Safety Policy 1-06.
- The number of expected yearly crashes was multiplied by twenty-five years to compensate for the design life of an at-grade crossing that would be constructed.

These steps resulted in the benefit-cost ratio shown in Table 3.3.1.

Table 3.3.1 - Safety Benefit-Cost Ratio

	Fatalities/year	Injuries/year	Crash Costs	*Grade Separation	Benefit/Cost
Alternative #3	0.017	0.035	$1,789,150	$9,300,000	0.19

*Grade separation costs include grade separation structure and all appurtent improvements

Additional safety benefits for Alternative #3 (Hershey Road: Morrissey to Hamilton) include creating an expected condition at the intersection of Hershey Road and Hamilton Road, and providing more direct emergency response to the new Unit 5 schools at the intersection of Morrissey Drive (US 150) and Hershey Road.

3.3.3 Travel Demand Model

The Travel Demand Model (TDM) was used as a tool to forecast existing and future travel demands throughout the southeastern portion of the City of Bloomington. After the model was calibrated to existing conditions, future alternatives were tested to determine if changes to the travel patterns adversely affect or enhance mobility for neighborhoods, businesses, and those traveling through the study area. The existing network was altered to reflect the changes caused by the proposed improvement alternative.

Four (4) TDM scenarios were completed to determine the effects that this alternative would have on the travel patterns and roadway congestion of the street network. Alternative #3 (Hershey Road: Morrissey to Hamilton) was analyzed with existing 2010 socioeconomic data and 2035 socioeconomic

data assuming that the Eastern Bypass is fully constructed. The following TDM scenarios were completed with the 2010 and 2035 socioeconomic data:

- Existing Street Network without Alternative #3 (2010 socioeconomic data),
- Existing Street Network without Alternative #3 (2035 socioeconomic data),
- Existing Street Network with Alternative #3 and with an at-grade crossing of the Norfolk Southern (2035 socioeconomic data), and
- Existing Network with Alternative #3 and a grade separated crossing of the Norfolk Southern (2035 socioeconomic data).

Using the TDM, the amount of time needed to travel through the study area via each entry and exit location was calculated for each network used to evaluate Alternative #3 (Hershey: Morrissey to Hamilton). The results of this analysis are shown in Table 3.3.2

Table 3.3.2 – Network Travel Time

TDM Network Scenario	Travel Time (Minutes)	% Difference*
Existing 2010	5202.55	-
Existing 2035	5755.13	10.62%
Alternative #3 2035 (At-Grade Crossing)	5447.63	4.71%
Alternative #3 2035 (Grade Separated Crossing)	5447.57	4.71%

*From Existing 2010

The analysis for the at-grade and grade separate railroad crossing networks takes into account delays from current daily train traffic (5 trains per day), and up to ten times the existing volume. The Norfolk Southern was contacted regarding potential future daily train traffic volumes on this track. At this time, the Norfolk Southern does not have any projections for future daily train traffic volumes on this track. Analysis of the travel times for the street networks shows that there is not much time savings for vehicles traveling the street network if the grade separated structure is constructed.

Given that Table 3.3.2 shows a marginal benefit to travel time estimates from constructing a grade separation and Table 3.3.1 provides a Benefit-Cost ratio of less than one, it is recommended that constructing a grade separated crossing with this alternative be eliminated from further analysis.

Relative changes between the Existing 2035 ADT and the ADT of the Alternative #3 network are provided in Table 3.3.3. An increase in projected traffic volume for a particular roadway would decrease that roadway's service life, and conversely, a decrease in the projected traffic volume would increase the roadway's service life; thus allowing only maintenance to be required for a longer time frame. Increases or decreases of approximately 10% are noted in Table 3.3.3. Other significant roadways are also provided for background information.

Table 3.3.3 – 2035 ADT Changes

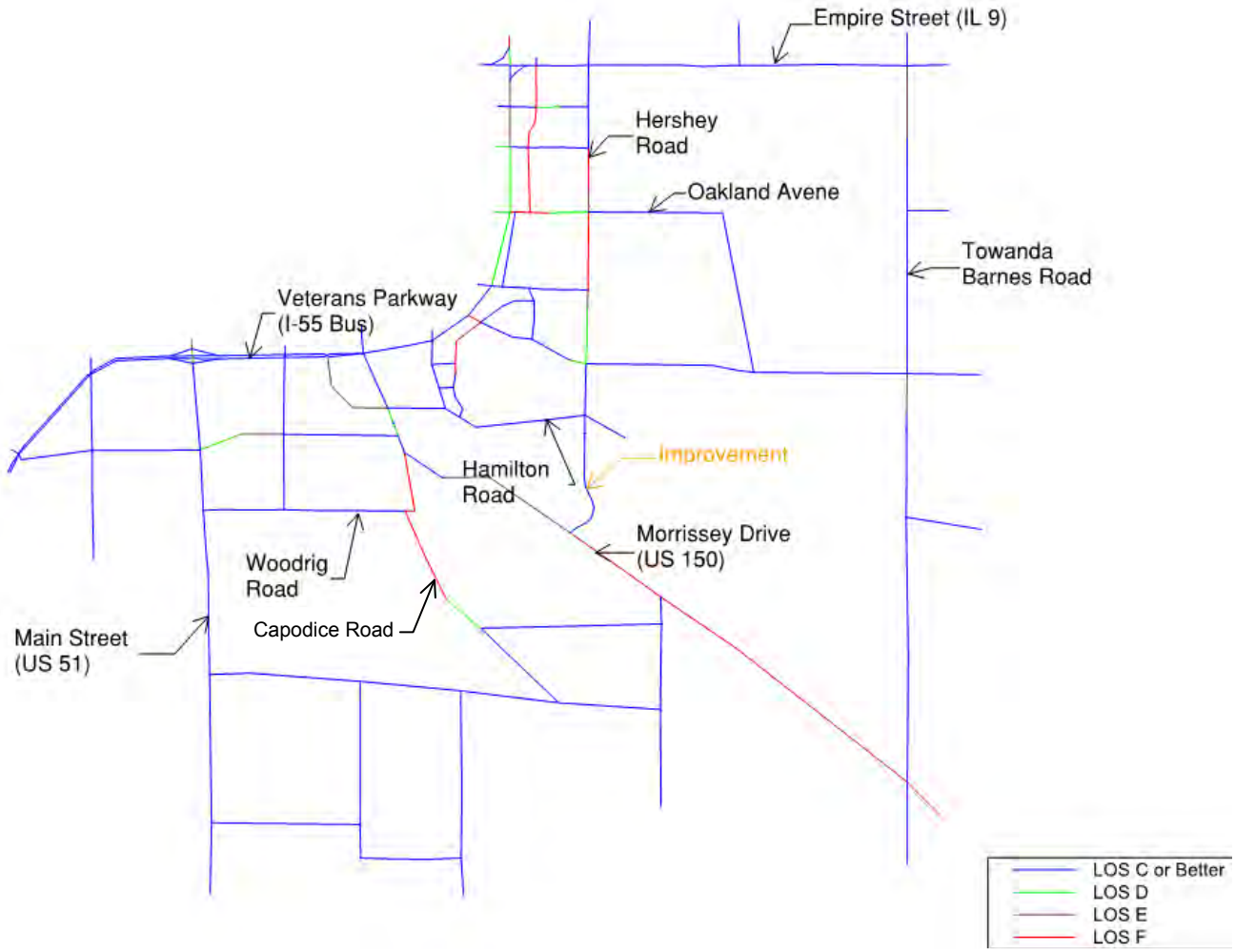
Roadway Segment	2035 No Build TDM ADT	2035 Hershey: Morrissey – Hamilton TDM ADT	Alternative v/c Ratio	LOS	% Change
Hershey (North of IGR)	28,526	25,664	0.86	D	-10.0%
Hershey (North of Oakland)	39,370	30,994	1.03	F	-21.3%
Hamilton (Main to Bunn)	14,720	11,032	0.88	D	-25.1%
Hamilton (Morrissey to Loop)	27,099	16,071	0.64	B	-40.7%
Morrissey (North of Hamilton)	23,338	18,965	0.63	B	-18.7%
Ireland Grove Road (East of Hershey)	19,338	16,525	0.66	B	-14.5%
IL 9 (East of Hershey)	36,868	33,131	0.60	B	-10.1%
Woodrig Road	3,891	3,011	0.24	A	-22.6%
Oakland (East of Hershey)	17,474	19,249	0.64	B	10.2%
Veterans (East of Morrissey)	57,515	55,549	0.67	B	-3.4%
Veterans (West of Morrissey)	46,871	42,969	0.52	B	-8.3%

For the 2035 condition, the roadway segment Level of Service (LOS) has been calculated for all street segments. A level-of-service (LOS) is a grading system whereby the quality of operation on a street system can be identified. LOS's range from an "A", the best traffic operation, to "F", the poorest. The LOS for roadways can be based on a ratio of the volume to total capacity (v/c) for a 24 hour period. It is generally accepted that for urbanized areas the minimum acceptable LOS is Level D. Table 3.3.4 describes LOS and the relationship to v/c ratio. For the purposes of analyzing this alternative, the LOS for streets in the study area are identified in Figure 3.3.3.

Table 3.3.4 - LOS Description

LOS	*Description*	*Volume to Capacity Ratio*
A	Free flowing traffic	< 0.50
B	Low-density stable traffic	0.51 – 0.70
C	Medium density stable traffic flow	0.71-0.80
D	High density stable traffic flow	0.81-0.90
E	Unstable flow at or near capacity levels	0.91-1.0
F	Breakdown of traffic flow	> 1.0

Figure 3.3.3 – Street LOS



3.3.4 Travel Demand Model Findings

Using Table 3.3.3 and Figure 3.3.3, the following conclusions can be made regarding traffic patterns and operations caused by implementing Alternative #3 (Hershey Road: Morrissey to Hamilton):

- Extending Hershey Road from Morrissey to Hamilton significantly changes travel patterns by allowing direct access to State Farm (and other commercial destinations) from the south, east, and west. This is evident by the significant improvement in LOS on Hamilton Road and Morrissey Drive north and west of the Hershey. Hamilton and Morrissey are no longer expected to fail if the Hershey Road extension is constructed.
- Service life extensions between 20% and 40% are expected on portions of Hamilton Road, Hershey Road, and Woodrig Road (east of Capodice Road).
- Service life extensions between 10% and 20% are expected on portions of Hershey Road, Morrissey Drive (US 150), Ireland Grove Road, and Empire Street (IL9).

- Hamilton Road, between Main Street (US 51) and Hershey Road provides a much needed east-west arterial roadway evident by the roadway reaching the calculated capacity within the planning horizon (2035).
- Constructing Hershey Road from Morrissey to Hamilton does alleviate congestion on Hershey Road north of Ireland Grove Road but not enough to keep the roadway from failing in sections.
- Capodice Road sees dramatic increases in traffic volumes because land development to the south and west uses this roadway to reach Morrissey Drive and Hamilton Road (east of Morrissey Drive) since Hamilton Road (east of Main Street) is reaching capacity. This roadway will likely need to be reconstructed to accommodate the trips if this land development occurs.

3.3.5 Travel Time Benefit-Cost Analysis

Because travel time changes based on the improvement constructed, a benefit-cost ratio was calculated for Alternative #3 (Hershey Road: Morrissey to Hamilton). A travel time benefit-cost ratio was not calculated for the grade separation alternative because the TDM analysis showed that traffic volumes and travel times were not greatly affected by constructing this improvement.

A breakdown of the costs for Alternative #3 is shown in Table 3.3.5. These costs result in the benefit-cost ratio shown in Table 3.3.6.

Table 3.3.5 – Alternative #3 (Hershey Road: Morrissey to Hamilton) Opinion of Probable Cost

Item	Opinion of Probable Cost
Construction	$6,750,000
Right-of-Way	$480,000
Engineering	$1,350,000
TOTAL	**$8,580,000**

Table 3.3.6 - Travel Time Benefit-Cost Ratio

	Benefit	Cost	Benefit/Cost
Alternative #3	$1,337,122,750	$8,580,000	155.84

The following steps were used to estimate the cost to construct Alternative #3.

- The length of the roadway proposed to be constructed was multiplied by the number of travel lanes required for adequate capacity by the TDM ADT estimates. In this case, the improvement is a 3 lane section for an ADT under 14,000.
- A unit cost of $500/foot/lane was multiplied by the previous product.
- The cost of right-of-way needed for the project is $60,000 per acre in urban areas and $20,000 per acre for rural areas. This alternative will require acquisition of approximately 12 acres; half of which was assumed to be acquired at the urban area unit cost.

- The cost of design and construction engineering was assumed to be 20% of the construction cost.

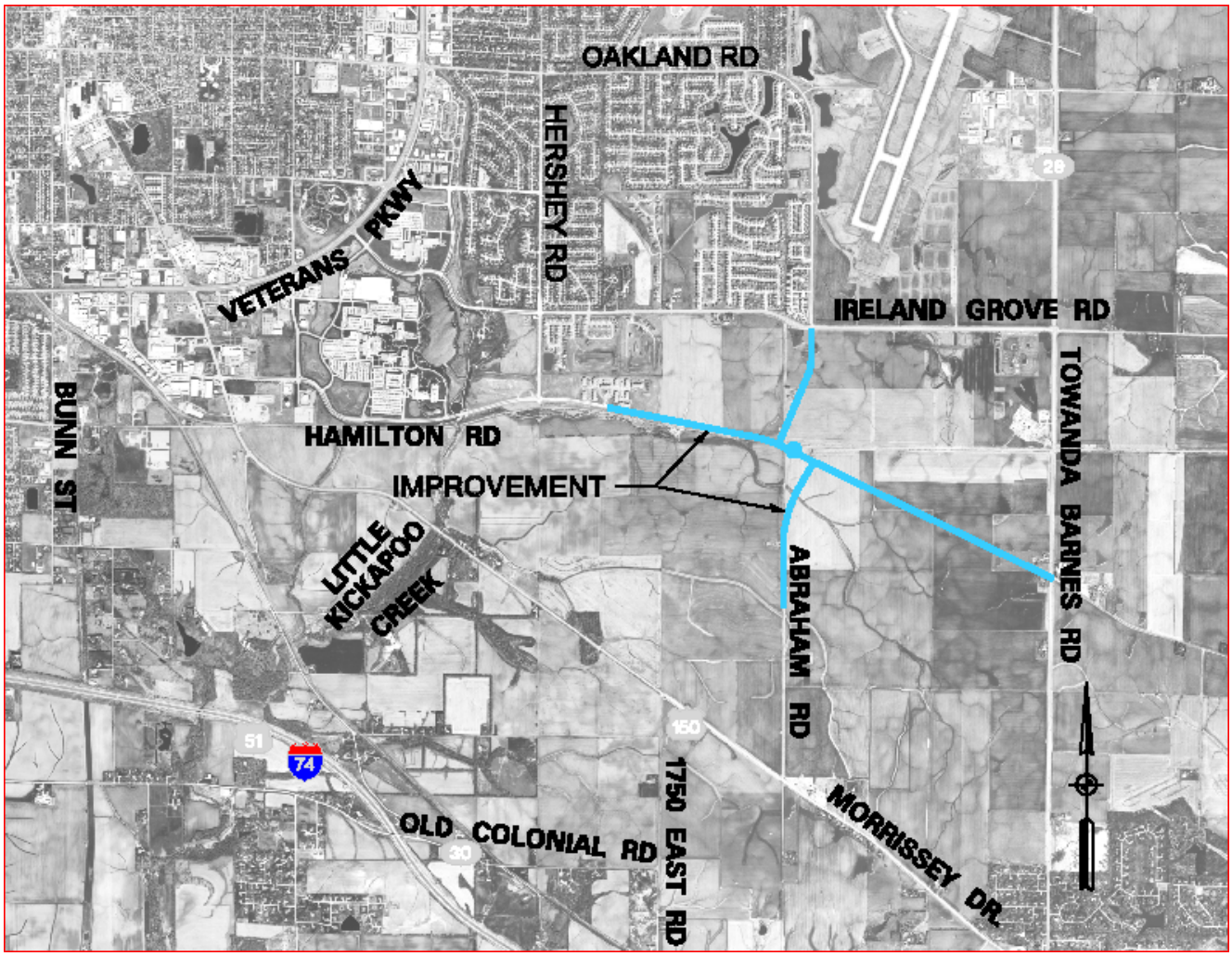
The following steps were used to calculate the travel time benefit per year for each alternative.

- The TDM calculated the time it takes to travel to and from each external station in the study area for the 2035 socioeconomic condition (Table 3.3.1).
- The calculated travel time for the alternative was subtracted from the calculated Existing 2035 travel time (Table 3.3.1).
- The difference in travel time was then multiplied by the ADT across the busiest link in the 2035 No Build alternative (71,480) and 365 days per year.
- An average wage of $10/hour was multiplied by the previous product.

3.4 Alternative #4 – Hamilton Road: Hershey to Towanda Barnes

Alternative #4 consists of constructing Hamilton Road from Hershey Road to Towanda Barnes Road and a new grade crossing at Hamilton Road near the intersection of Abraham Road and the Norfolk Southern Railroad tracks. Constructing this improvement provides a continuous east-west arterial street from Morrissey Drive (US 150) to Towanda Barnes Road while providing access to undeveloped land between east of Hershey Road, Empire Street (IL 9) to Morrissey Drive (US 150). This alignment requires the realignment of Abraham Road north and south of the Hamilton Road extension creating two new intersections. Because this improvement requires crossing the Norfolk Southern Railway, at-grade and grade separated crossing alternatives were considered in the following analysis. See Figure 3.4.1 for a graphical description of this alternative.

Figure 3.4.1 – Alternative #4 – Hamilton: Hershey to Towanda Barnes



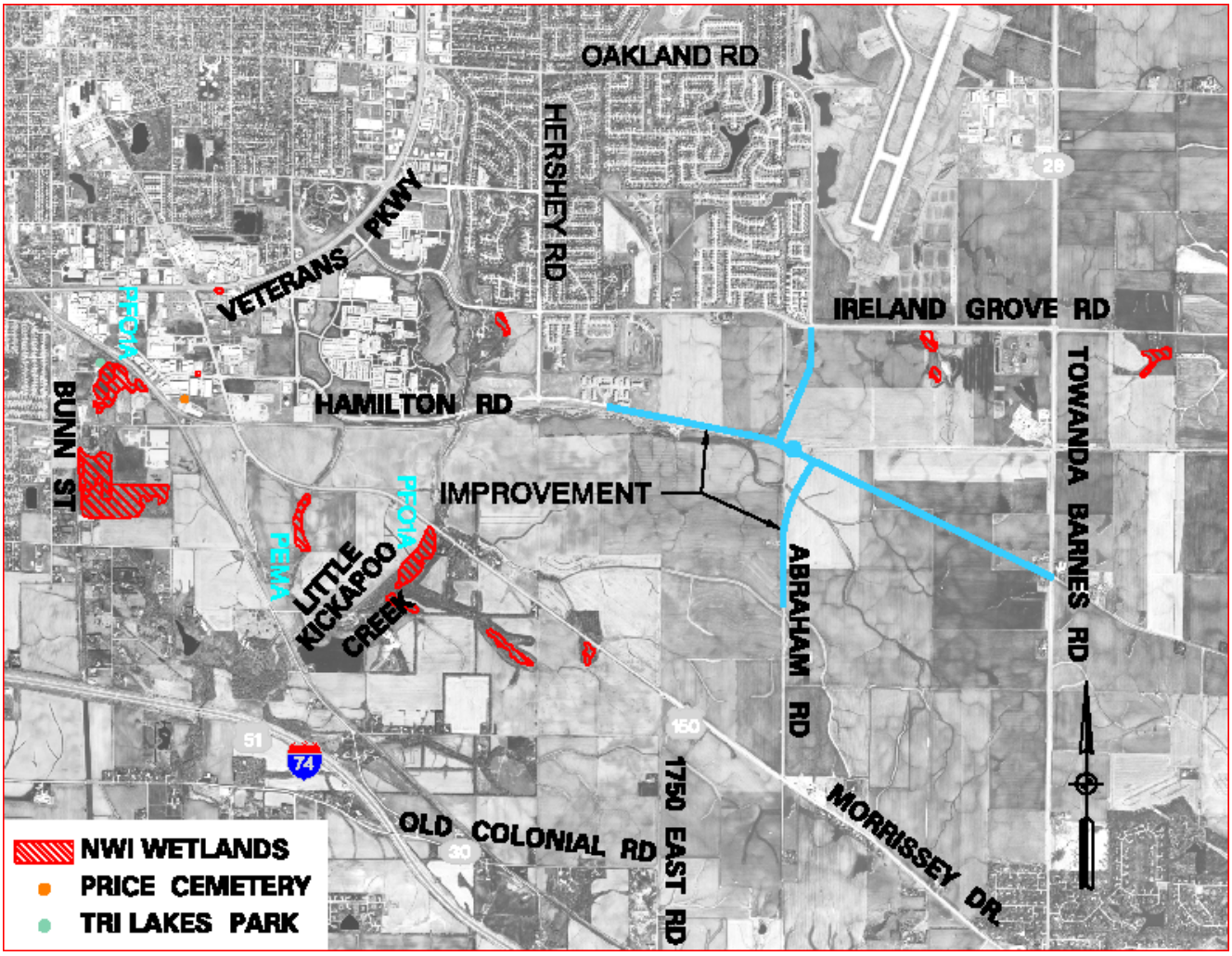
3.4.1 Environmental

A preliminary environmental inventory was conducted for Alternative #4 (Hamilton Road: Hershey to Towanda Barnes). A site visit, research of databases, and research of available aerial mapping were completed to determine possible environmental impacts that could inhibit or delay construction of this alternative. Considerations were given to impacts associated with:

- Agricultural Land,
- Parks and Recreation Areas,
- Surface Water Resources,
- Wetlands,
- Cultural Resources,
- Special Waste, and
- Threatened and Endangered Species/Natural Resources.

The analysis determined that this alternative may require residential relocations, impacts to wetlands not mapped on the NWI map, and traffic disturbance. The residential relocations could possibly be avoided through engineering study if the proposed intersection of Hamilton Road and Towanda Barnes Road was moved to the south. Figure 3.4.2 maps the preliminary known impacts of the alternative.

Figure 3.4.2 – Preliminary Environmental Impacts



3.4.2 Safety

The safety benefit-cost analysis compares the costs associated with the number of fatalities and injuries predicted to occur at an at-grade railroad crossing versus the cost of constructing a grade separation with zero fatalities and injuries from crashes between trains and vehicles. If the safety benefit-cost ratio was calculated to be less than 0.50, then the safety benefits of the improvement were considered insignificant.

The following steps were used to calculate the costs associated with predicted fatalities and injuries for each alternative.

- The number of crashes expected at each at-grade railroad crossing was predicted using a formula from "Assessment of Risks for High-Speed Rail Grade Crossings on the Empire Corridor" published in August 2000 by the U.S. Department of Transportation (USDOT) Federal Railroad Administration (FRA).
- The Federal Transit Administration's (FTA) State Safety Oversight program estimates that 0.25 fatalities occur per crash.
- Combining data from the USDOT FRA and FTA State Safety Oversight program, an estimated 0.50 injuries occur per crash.
- The cost of $3.76 million was assigned to expected fatalities per the Illinois Department of Transportation Safety Policy 1-06.
- The cost of $188,000 was assigned to expected injuries per the Illinois Department of Transportation Safety Policy 1-06.
- The number of expected yearly crashes was multiplied by twenty-five years to compensate for the design life of an at-grade crossing that would be constructed.

These steps resulted in the benefit-cost ratio shown in Table 3.4.1.

Table 3.4.1 - Safety Benefit-Cost Ratio

	Fatalities/year	Injuries/year	Crash Costs	*Grade Separation	Benefit/Cost
Alternative #4	0.014	0.029	$1,483,388	$9,300,000	0.16

*Grade separation costs include grade separation structure and all appurtent improvements

Additional safety benefits for Alternative #4 (Hamilton: Hershey to Towanda Barnes) include creating a perpendicular intersection alignment at the intersection of Hamilton Road/Cheney's Grove Road and Towanda Barnes Road.

3.4.3 Travel Demand Model

The Travel Demand Model (TDM) was used as a tool to forecast existing and future travel demands throughout the southeastern portion of the City of Bloomington. After the model was calibrated to existing conditions, future alternatives were tested to determine if changes to the travel patterns adversely affect or enhance mobility for neighborhoods, businesses, and those traveling through the study area. The existing network was altered to reflect the changes caused by the proposed improvement alternative.

Four (4) TDM scenarios were completed to determine the effects that this alternative would have on the travel patterns and roadway congestion of the street network. Alternative #4 (Hamilton Road: Hershey to Towanda Barnes) was analyzed with existing 2010 socioeconomic data and 2035 socioeconomic

data assuming that the Eastern Bypass is fully constructed. The following TDM scenarios were completed with the 2010 and 2035 socioeconomic data:

- Existing Street Network without Alternative #4 (2010 socioeconomic data),
- Existing Street Network without Alternative #4 (2035 socioeconomic data),
- Existing Street Network with Alternative #4 and with an at-grade crossing of the Norfolk Southern (2035 socioeconomic data), and
- Existing Network with Alternative #4 and a grade separated crossing of the Norfolk Southern (2035 socioeconomic data).

Using the TDM, the amount of time needed to travel through the study area via each entry and exit location was calculated for each network used to evaluate Alternative #4 (Hamilton Road: Hershey to Towanda Barnes). The results of this analysis are shown in Table 3.4.2

Table 3.4.2 – Network Travel Time

TDM Network Scenario	Travel Time (Minutes)	% Difference*
Existing 2010	5202.55	-
Existing 2035	5755.13	10.62%
Alternative #4 2035 (At-Grade Crossing)	5525.30	6.20%
Alternative #4 2035 (Grade Separated Crossing)	5529.40	6.28%

*From Existing 2010

The analysis for the at-grade and grade separate railroad crossing networks takes into account delays from current daily train traffic (5 trains per day), and up to ten times the existing volume. The Norfolk Southern was contacted regarding potential future daily train traffic volumes on this track. At this time, the Norfolk Southern does not have any projections for future daily train traffic volumes on this track. Analysis of the travel times for the street networks shows that there is no time savings for vehicles traveling the street network if the grade separated structure is constructed.

Given that Table 3.4.2 shows no benefit to travel time estimates from constructing a grade separation and Table 3.4.1 provides a benefit-cost ratio of less than one, it is recommended that constructing a grade separated crossing with this alternative be eliminated from further analysis.

Relative changes between the Existing 2035 ADT and the ADT of the Alternative #4 network are provided in Table 3.4.3. An increase in projected traffic volume for a particular roadway would decrease that roadway's service life, and conversely, a decrease in the projected traffic volume would increase the roadway's service life; thus allowing only maintenance to be required for a longer time frame. Increases or decreases of approximately 10% are noted in Table 3.4.3. Other significant roadways are also provided for background information.

Table 3.4.3 – 2035 ADT Changes

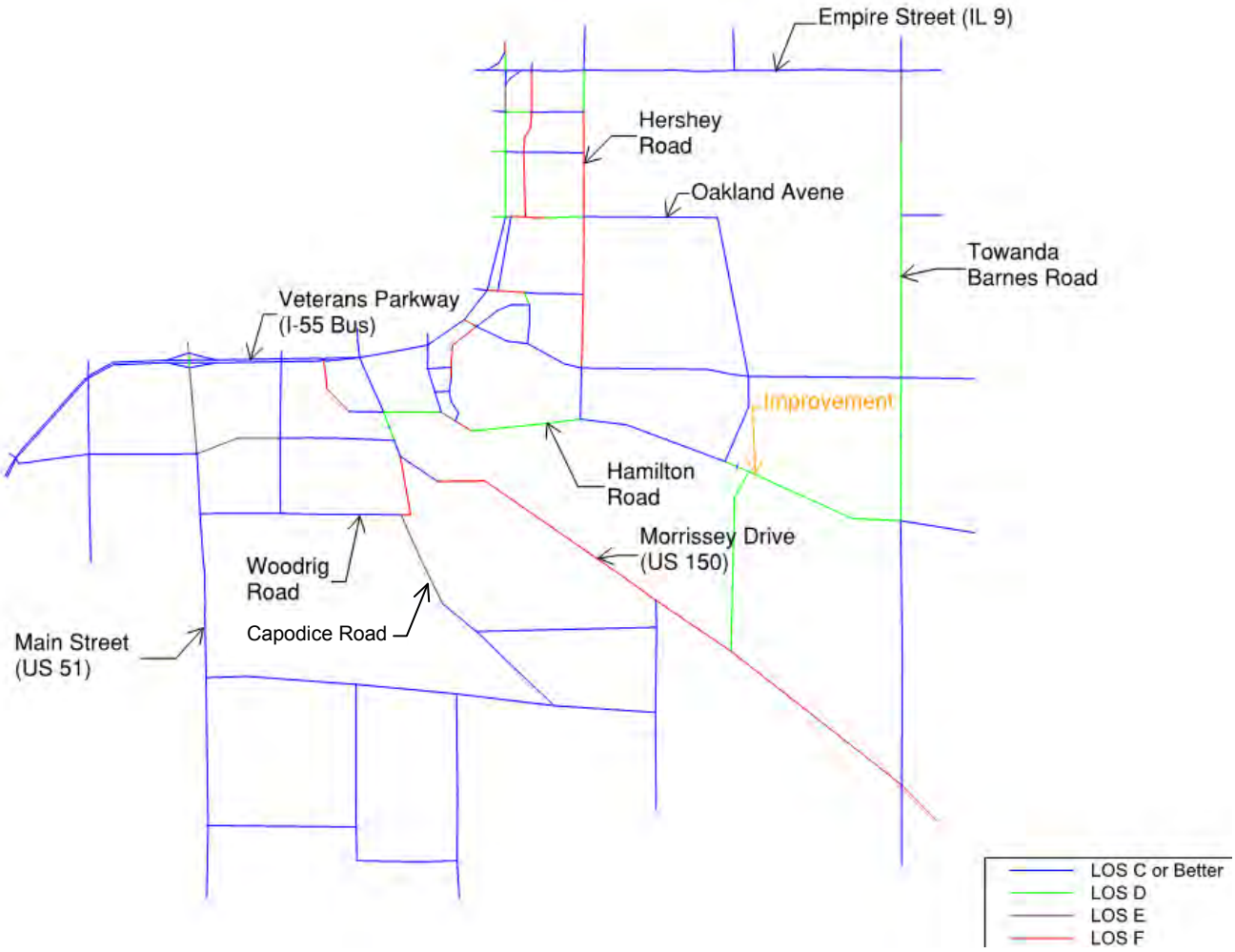
Roadway Segment	2035 No Build TDM ADT	2035 Hamilton: Hershey - Towanda Barnes TDM ADT	Alternative v/c Ratio	LOS	% Change
Hershey (North of IGR)	28,526	31,187	1.04	F	9.3%
Hamilton (Main to Bunn)	14,720	12,437	0.99	E	-15.5%
Hamilton (Morrissey to Loop)	27,099	21,905	0.87	D	-19.2%
Morrissey (North of Hamilton)	23,338	19,969	0.66	B	-14.4%
Morrissey (South of Woodrig)	22,220	19,122	0.63	B	-13.9%
Ireland Grove Road (East of Hershey)	19,338	14,945	0.59	B	-22.7%
Ireland Grove Road (East of Stried)	23,292	20,115	0.67	B	-13.6%
IL 9 (East of Hershey)	36,868	31,200	0.56	B	-15.4%
Woodrig Road	3,891	6,284	0.50	A	61.5%
Towanda Barnes (South of IGR)	30,399	24,692	0.82	D	-18.8%
Veterans (East of Morrissey)	57,515	52,739	0.63	B	-8.3%
Veterans (West of Morrissey)	46,871	41,205	0.49	A	-12.1%

For the 2035 condition, the roadway segment Level of Service (LOS) has been calculated for all street segments. A level-of-service (LOS) is a grading system whereby the quality of operation on a street system can be identified. LOS's range from "A", the best traffic operation, to "F", the poorest. The LOS for roadways can be based on a ratio of the volume to total capacity (v/c) for a 24 hour period. It is generally accepted that for urbanized areas the minimum acceptable LOS is Level D. Table 3.4.4 describes LOS and the relationship to v/c ratio. For the purposes of analyzing this alternative, the LOS for streets in the study area are identified in Figure 3.4.3.

Table 3.4.4 - LOS Description

LOS	*Description*	*Volume to Capacity Ratio*
A	Free flowing traffic	< 0.50
B	Low-density stable traffic	0.51 – 0.70
C	Medium density stable traffic flow	0.71-0.80
D	High density stable traffic flow	0.81-0.90
E	Unstable flow at or near capacity levels	0.91-1.0
F	Breakdown of traffic flow	> 1.0

Figure 3.4.3 – Street LOS



3.4.4 Travel Demand Model Findings

Using Table 3.4.3 and Figure 3.4.3, the following conclusions can be made regarding traffic patterns and operations caused by implementing Alternative #4 (Hamilton Road: Hershey to Towanda Barnes):

- Extending Hamilton Road from Hershey Road to Towanda Barnes Road significantly changes travel patterns by allowing direct access to State Farm (and other commercial destinations) from south and east. This is evident by the significant improvement in LOS on Hamilton Road and Morrissey Drive north and west of the Hershey. Hamilton and Morrissey are no longer expected to fail if the Hamilton Road extension is constructed.
- The service life of Ireland Grove Road is expected to be extended by approximately 22%.
- Service life extensions between 10% and 20% are expected on portions of Hamilton Road west of Loop Road, Morrissey Drive (US 150), Empire Street (IL 9), Towanda Barnes Road south of Ireland Grove Road, and Veterans Parkway (I-55 Bus) west of Morrissey Drive.

- Constructing Hamilton Road (Hershey Road to Towanda Barnes) should be accompanied by improvements to Abraham Road. This is evident because the north-south connection between Morrissey Drive and Hamilton Road east of Towanda Barnes is shown to operate at LOS D. Existing Abraham Road is a township road that is not designed to handle high traffic volumes. Without the Abraham Road connection, this alternative would not change travel patterns as significantly as shown above.
- Capodice Road sees dramatic increases in traffic volumes because land development to the south and west uses this roadway to reach Morrissey Drive and Hamilton Road (east of Morrissey Drive) since Hamilton Road (east of Main Street) is reaching capacity. This roadway will likely need to be reconstructed to accommodate the trips if this land development occurs.

3.4.5 Travel Time Benefit-Cost Analysis

Because travel time changes based on the improvement constructed, a benefit-cost ratio was calculated for Alternative #4 (Hamilton Road: Hershey to Towanda Barnes). A travel time benefit-cost ratio was not calculated for the grade separation alternative because the TDM analysis showed that traffic volumes and travel times were not greatly affected by constructing this improvement.

A breakdown of the costs for Alternative #1 is shown in Table 3.4.5. These costs result in the benefit-cost ratio shown in Table 3.4.6.

Table 3.4.5 – Alternative #4 (Hamilton: Hershey to Towanda Barnes) Opinion of Probable Cost

Item	Opinion of Probable Cost
Construction	$27,500,000
Right-of-Way	$1,080,000
Engineering	$5,500,000
TOTAL	**$34,080,000**

Table 3.4.6 - Travel Time Benefit-Cost Ratio

	Benefit	Cost	Benefit/Cost
Alternative #4	$999,385,111	$34,080,000	29.32

The following steps were used to estimate the cost to construct Alternative #4.

- The length of the roadway proposed to be constructed was multiplied by the number of travel lanes required for adequate capacity by the TDM ADT estimates. In this case, the improvement is a 5 lane section for an ADT over 14,000.
- A unit cost of $500/foot/lane was multiplied by the previous product.
- The cost of right-of-way needed for the project is $60,000 per acre in urban areas and $20,000 per acre for rural areas. This alternative will require acquisition of approximately 30 acres; 60% of which was assumed to be acquired at the rural area unit cost.

- The cost of design and construction engineering was assumed to be 20% of the construction cost.

The following steps were used to calculate the travel time benefit per year for each alternative.

- The TDM calculated the time it takes to travel to and from each external station in the study area for the 2035 socioeconomic condition (Table 3.4.1).
- The calculated travel time for the alternative was subtracted from the calculated Existing 2035 travel time (Table 3.4.1).
- The difference in travel time was then multiplied by the ADT across the busiest link in the 2035 No Build alternative (71,480) and 365 days per year.
- An average wage of $10/hour was multiplied by the previous product.

3.5 Alternative #5 – Towanda Barnes Grade Separation

Alternative #5 consists of constructing a grade separation between Towanda Barnes Road and the Norfolk Southern Railroad tracks. Because this improvement requires crossing the Norfolk Southern Railway, the existing network and a grade separated crossing alternative were considered in the following analysis. See Figure 3.5.1 for a graphical description of this alternative.

Figure 3.5.1 – Alternative #5 Towanda Barnes Grade Separation

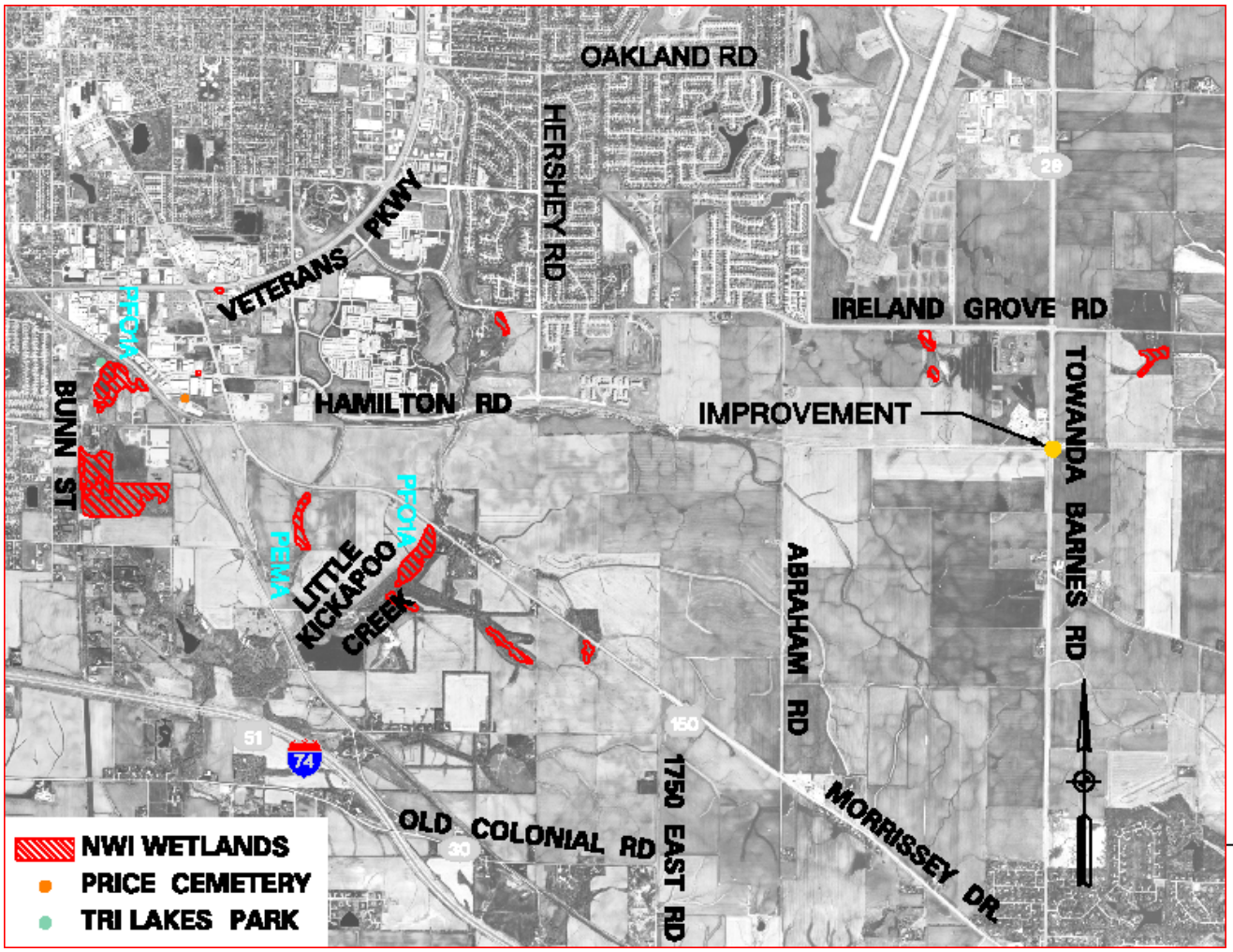
3.5.1 Environmental

A preliminary environmental inventory was conducted for Alternative #5 (Towanda Barnes Grade Separation). A site visit, research of databases, and research of available aerial mapping were completed to determine possible environmental impacts that could inhibit or delay construction of this alternative. Considerations were given to impacts associated with:

- Agricultural Land,
- Parks and Recreation Areas,
- Surface Water Resources,
- Wetlands,
- Cultural Resources,
- Special Waste, and
- Threatened and Endangered Species/Natural Resources.

The analysis determined that this alternative could possibly require no relocations, no NWI mapped wetland impacts, and some traffic disturbance. Figure 3.5.2 maps the preliminary known impacts of the alternative.

Figure 3.5.2 – Preliminary Environmental Impacts



3.5.2 Safety

The safety benefit-cost analysis compares the costs associated with the number of fatalities and injuries predicted to occur at an at-grade railroad crossing versus the cost of constructing a grade separation with zero fatalities and injuries from crashes between trains and vehicles. If the safety benefit-cost ratio was calculated to be less than 0.50, then the safety benefits of the improvement were considered insignificant.

The following steps were used to calculate the costs associated with predicted fatalities and injuries for each alternative.

- The number of crashes expected at each at-grade railroad crossing was predicted using a formula from "Assessment of Risks for High-Speed Rail Grade Crossings on the Empire Corridor" published in August 2000 by the U.S. Department of Transportation (USDOT) Federal Railroad Administration (FRA).
- The Federal Transit Administration's (FTA) State Safety Oversight program estimates that 0.25 fatalities occur per crash.
- Combining data from the USDOT FRA and FTA State Safety Oversight program, an estimated 0.50 injuries occur per crash.
- The cost of $3.76 million was assigned to expected fatalities per the Illinois Department of Transportation Safety Policy 1-06.
- The cost of $188,000 was assigned to expected injuries per the Illinois Department of Transportation Safety Policy 1-06.
- The number of expected yearly crashes was multiplied by twenty-five years to compensate for the design life of an at-grade crossing that would be constructed.

These steps resulted in the benefit-cost ratio shown in Table 3.5.1.

Table 3.5.1 - Safety Benefit-Cost Ratio

	Fatalities/year	Injuries/year	Crash Costs	*Grade Separation	Benefit/Cost
Alternative #5	0.021	0.043	$2,220,147	$9,300,000	0.24

*Grade separation costs include grade separation structure and all appurtent improvements

There are no perceived additional safety benefits from constructing this alternative.

3.5.3 Travel Demand Model

The Travel Demand Model (TDM) was used as a tool to forecast existing and future travel demands throughout the southeastern portion of the City of Bloomington. After the model was calibrated to existing conditions, future alternatives were tested to determine if changes to the travel patterns adversely affect or enhance mobility for neighborhoods, businesses, and those traveling through the study area. The existing network was altered to reflect the changes caused by the proposed improvement alternative.

Three (3) TDM scenarios were completed to determine the effects that this alternative would have on the travel patterns and roadway congestion of the street network. Alternative #5 (Towanda Barnes Road Grade Separation) was analyzed with existing 2010 socioeconomic data and 2035 socioeconomic data assuming that the Eastern Bypass is fully constructed. The following TDM scenarios were completed with the 2010 and 2035 socioeconomic data:

- Existing Street Network without Alternative #5 (2010 socioeconomic data),
- Existing Street Network without Alternative #5 (2035 socioeconomic data), and
- Existing Network with Alternative #5 and a grade separated crossing of the Norfolk Southern (2035 socioeconomic data).

Using the TDM, the amount of time needed to travel through the study area via each entry and exit location was calculated for each network used to evaluate Alternative #5 (Towanda Barnes Grade Separation). The results of this analysis are shown in Table 3.5.2

Table 3.5.2 – Network Travel Time

TDM Network Scenario	Travel Time (Minutes)	% Difference*
Existing 2010	5202.55	-
Existing 2035	5755.13	10.62%
Alternative #5 2035 (Grade Separated Crossing)	5696.34	9.49%

*From Existing 2010

The analysis for the at-grade and grade separate railroad crossing networks takes into account delays from current daily train traffic (5 trains per day), and up to ten times the existing volume. The Norfolk Southern was contacted regarding potential future daily train traffic volumes on this track. At this time, the Norfolk Southern does not have any projections for future daily train traffic volumes on this track. Analysis of the travel times for the street networks shows that there is a 1.13% travel time savings across the entire 2035 street network if Towanda Barnes Grade Separation is constructed. It should be noted that this travel time savings is not significant when compared to other alternatives studied.

Given that Table 3.5.2 shows a marginal benefit to travel time estimates, compared to other alternatives, from constructing a grade separation and Table 3.5.1 provides a Safety benefit-cost ratio of less than one, it is recommended that constructing this grade separated crossing alternative be eliminated from further analysis.

Further analysis using the TDM was not completed because travel times, levels-of-service, and travel patterns were not significantly changed from Existing 2035 network conditions by implementing the Towanda Barnes Grade Separation.

3.5.4 Travel Time Benefit-Cost Analysis

Because there is a slight improvement in travel time if the improvement is constructed, a benefit-cost ratio was calculated for Alternative #5 (Towanda Barnes Grade Separation).

Costs for this grade separation alternative, with roadway over or under the railroad, were considered using the following design criteria:

- Vertical clearance over roadway – 17 ft
- Vertical clearance over railroad – 23 ft
- Roadway Width – 60 ft (4~12 ft lanes, 2~6 ft shoulders)
- Roadway improvement length is 1600 feet
- Roadway grades – maximum 5%

At the existing Towanda Barnes Road crossing, there are no major buildings close to the proposed crossing. However, a power substation is located approximately 600 feet north of the intersection. Both overpass and underpass options are possible with retaining walls.

A breakdown of the costs for Alternative #5 is shown in Table 3.5.3. These costs result in the benefit-cost ratio shown in Table 3.5.4.

Table 3.5.3 – Alternative #5 (Towanda Barnes Grade Separation) Opinion of Probable Cost

Item	Opinion of Probable Cost
Construction	$9,300,000
Right-of-Way	$200,000
Engineering	$1,860,000
TOTAL	**$11,360,000**

Table 3.5.4 - Travel Time Benefit-Cost Ratio

	Benefit	Cost	Benefit/Cost
Alternative #5	$255,640,476	$11,360,000	22.50

The following steps were used to estimate the cost to construct Alternative #5.

- The roadway and bridge assumptions are given above.
- The cost of right-of-way needed for the project is $60,000 per acre in urban areas and $20,000 per acre for rural areas. This alternative will require acquisition of approximately 5 acres, half of which was assumed to be acquired at the urban area unit cost.
- The cost of design and construction engineering was assumed to be 20% of the construction cost.

The following steps were used to calculate the travel time benefit for each alternative.

- The TDM calculated the time it takes to travel to and from each external station in the study area for the 2035 socioeconomic condition (Table 3.5.1).
- The calculated travel time for the alternative was subtracted from the calculated Existing 2035 travel time (Table 3.5.1).

- The difference in travel time was then multiplied by the ADT across the busiest link in the 2035 No Build alternative (71,480).
- An average wage of $10/hour was multiplied by the previous product.

The calculated benefit-cost ratio is low compared to other alternatives, which provides further evidence that Alternative #5 – Towanda Barnes Grade Separation should not be carried forward to construction.

3.6 Alternative #6 – Hamilton Road: Rhodes Lane Alignment

Alternative #6 consists of constructing Hamilton Road from Bunn to Towanda Barnes along the Rhodes Lane Alignment. Constructing this improvement provides a continuous east-west arterial street from west of Veterans Parkway (I-55 Business) to Towanda Barnes Road. This improvement is south of the Norfolk Southern railroad tracks so a new crossing is not required. This alignment creates a new intersection with the proposed extension of Hershey Road south to US 150, requires an extension of Streid Drive from Ireland Grove Road south to Abraham Road, and creates a new intersection with existing Abraham Road. See Figure 3.6.1 for a graphical description of this alternative.

Figure 3.6.1 – Alternative #6 – Hamilton Road: Rhodes Lane Alignment

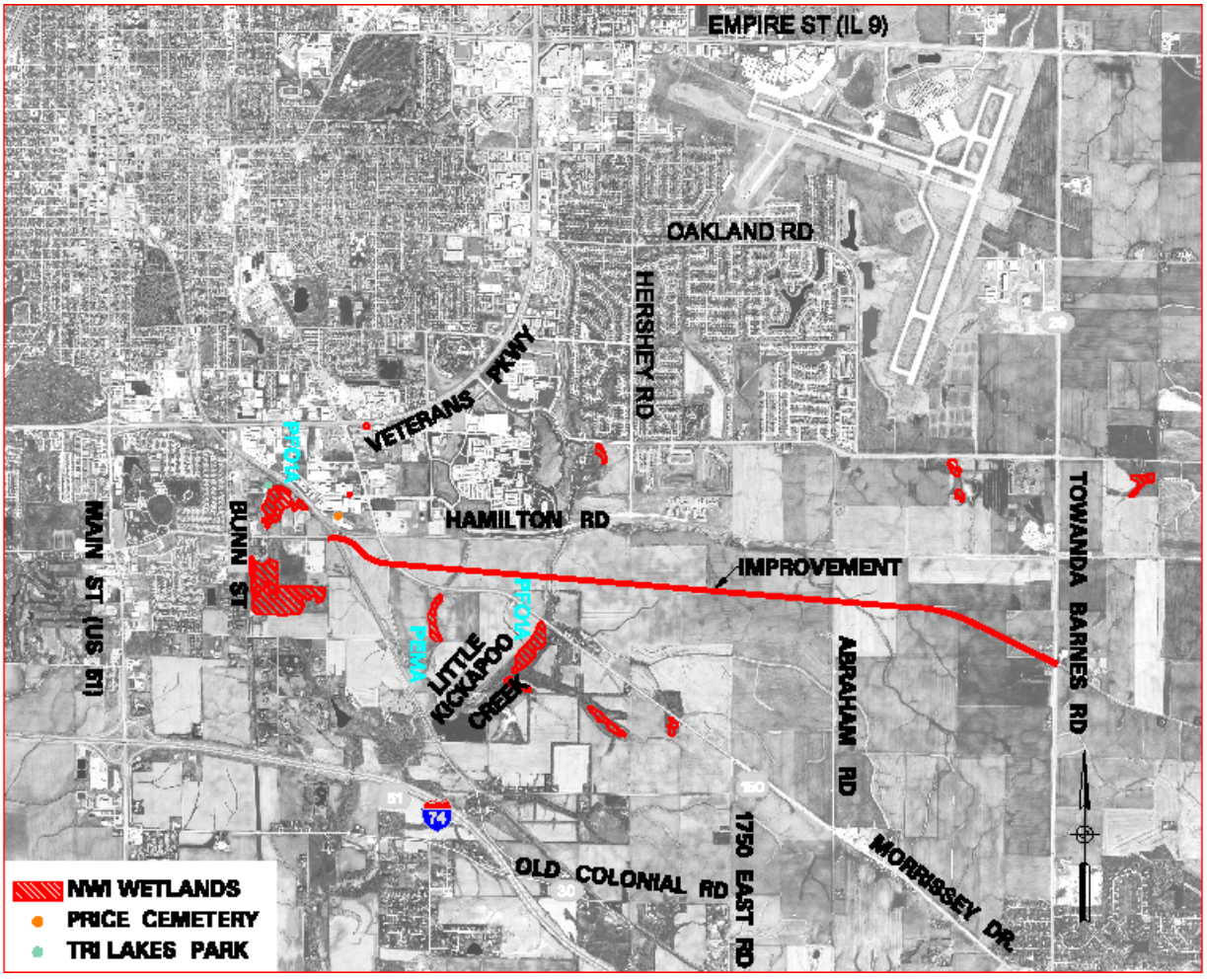
3.6.1 Environmental

A preliminary environmental inventory was conducted for Alternative #6 (Hamilton Road: Rhodes Lane Alignment). A site visit, research of databases, and research of available aerial mapping were completed to determine possible environmental impacts that could inhibit or delay construction of this alternative. Considerations were given to impacts associated with:

- Agricultural Land,
- Parks and Recreation Areas,
- Surface Water Resources,
- Wetlands,
- Cultural Resources,
- Special Waste, and
- Threatened and Endangered Species/Natural Resources.

The analysis determined that this alternative may cause waters of the United States impacts at Little Kickapoo Creek and its tributaries, impacts to the Little Kickapoo Creek floodway, impacts to wetlands not mapped on the NWI map, residential relocations, and more traffic disturbance. The residential relocations at Towanda Barnes Road could possibly be eliminated if a new roadway alignment was constructed moving the intersection to the south. Figure 3.6.2 maps the preliminary known impacts of the alternative.

Figure 3.6.2 – Preliminary Environmental Impacts



3.6.2 Safety

The safety benefit-cost analysis compares the costs associated with the number of fatalities and injuries predicted to occur at an at-grade railroad crossing versus the cost of constructing a grade separation with zero fatalities and injuries from crashes between trains and vehicles. Since constructing this improvement does not include crossing the Norfolk Southern, a safety benefit-cost ratio could not be calculated. However, there is some safety benefit of constructing this alternative because of the removal of conflict between an arterial roadway (Hamilton Road) and the Norfolk Southern Railroad.

If this alternative is constructed, there would likely be a decrease in safety operations because the intersection of Rhodes Lane (now Hamilton Road) and Morrissey Drive would see a significant increase in traffic volume and delay. This condition could cause queuing and operational conflicts with the nearby Morrissey Drive at-grade crossing with the Norfolk Southern.

3.6.3 Travel Demand Model

The Travel Demand Model (TDM) was used as a tool to forecast existing and future travel demands throughout the southeastern portion of the City of Bloomington. After the model was calibrated to existing conditions, future alternatives were tested to determine if changes to the travel patterns adversely affect or enhance mobility for neighborhoods, businesses, and those traveling through the study area. The existing network was altered to reflect the changes caused by the proposed improvement alternative.

Three (3) TDM scenarios were completed to determine the effects that this alternative would have on the travel patterns and roadway congestion of the street network. Alternative #6 (Hamilton: Rhodes Lane Alignment) was analyzed with existing 2010 socioeconomic data and 2035 socioeconomic data assuming that the Eastern Bypass is fully constructed. The following TDM scenarios were completed with the 2010 and 2035 socioeconomic data:

- Existing Street Network without Alternative #6 (2010 socioeconomic data),
- Existing Street Network without Alternative #6 (2035 socioeconomic data), and
- Existing Street Network with Alternative #6 (2035 socioeconomic data).
-

Using the TDM, the amount of time needed to travel through the study area via each entry and exit location was calculated for each network used to evaluate Alternative #6 (Hamilton: Rhodes Lane Alignment). The results of this analysis are shown in Table 3.6.2.

Table 3.6.2 – Network Travel Time

TDM Network Scenario	Travel Time (Minutes)	% Difference*
Existing 2010	5202.55	-
Existing 2035	5755.13	10.62%
Alternative #6 2035	5291.61	1.71%

*From Existing 2010

Table 3.6.2 shows that a large travel time benefit occurs for the entire transportation network if Hamilton Road is constructed to create a continuous east-west arterial from Main Street (US 51) to Towanda Barnes Road. It should be assumed that if Alternative #1 – Hamilton: Bunn to Commerce and Alternative #4 – Hamilton: Hershey to Towanda Barnes are both constructed to form a continuous arterial that a similar travel time benefit for the transportation system would occur.

Relative changes between the Existing 2035 average daily traffic (ADT) and the ADT of the Alternative #6 network are provided in Table 3.6.2. An increase in projected traffic volume for a particular roadway would decrease that roadway's service life, and conversely, a decrease in the projected traffic volume would increase the roadway's service life; thus allowing only maintenance to be required for a longer time frame. Increases or decreases of approximately 10% are noted in Table 3.6.3. Other significant roadways are also provided for background information.

Table 3.6.3 – 2035 ADT Changes

Roadway Segment	2035 No Build TDM ADT	2035 Hamilton: Rhodes Lane Alignment TDM ADT	Alternative v/c Ratio	LOS	% Change
Hershey (North of Oakland)	39,370	37,123	1.23	F	-5.7%
Hamilton (Main to Bunn)	14,720	12,948	1.03	F	-12.0%
Morrissey (North of Hamilton)	23,338	21,695	0.72	C	-7.0%
Morrissey (South of Woodrig)	22,220	12,204	0.40	A	-45.1%
Ireland Grove Road (East of Hershey)	19,338	16,747	0.66	B	-13.4%
Ireland Grove Road (East of Stried)	23,292	20,832	0.69	B	-10.6%
IL 9 (East of Hershey)	36,868	33,780	0.61	B	-8.4%
Woodrig Road	3,891	5,771	0.46	A	48.3%
Towanda Barnes (North of IGR)	30,009	26,134	0.87	D	-12.9%
Veterans (East of Morrissey)	57,515	53,671	0.65	B	-6.7%
Veterans (West of Morrissey)	46,871	43,201	0.52	B	-7.8%

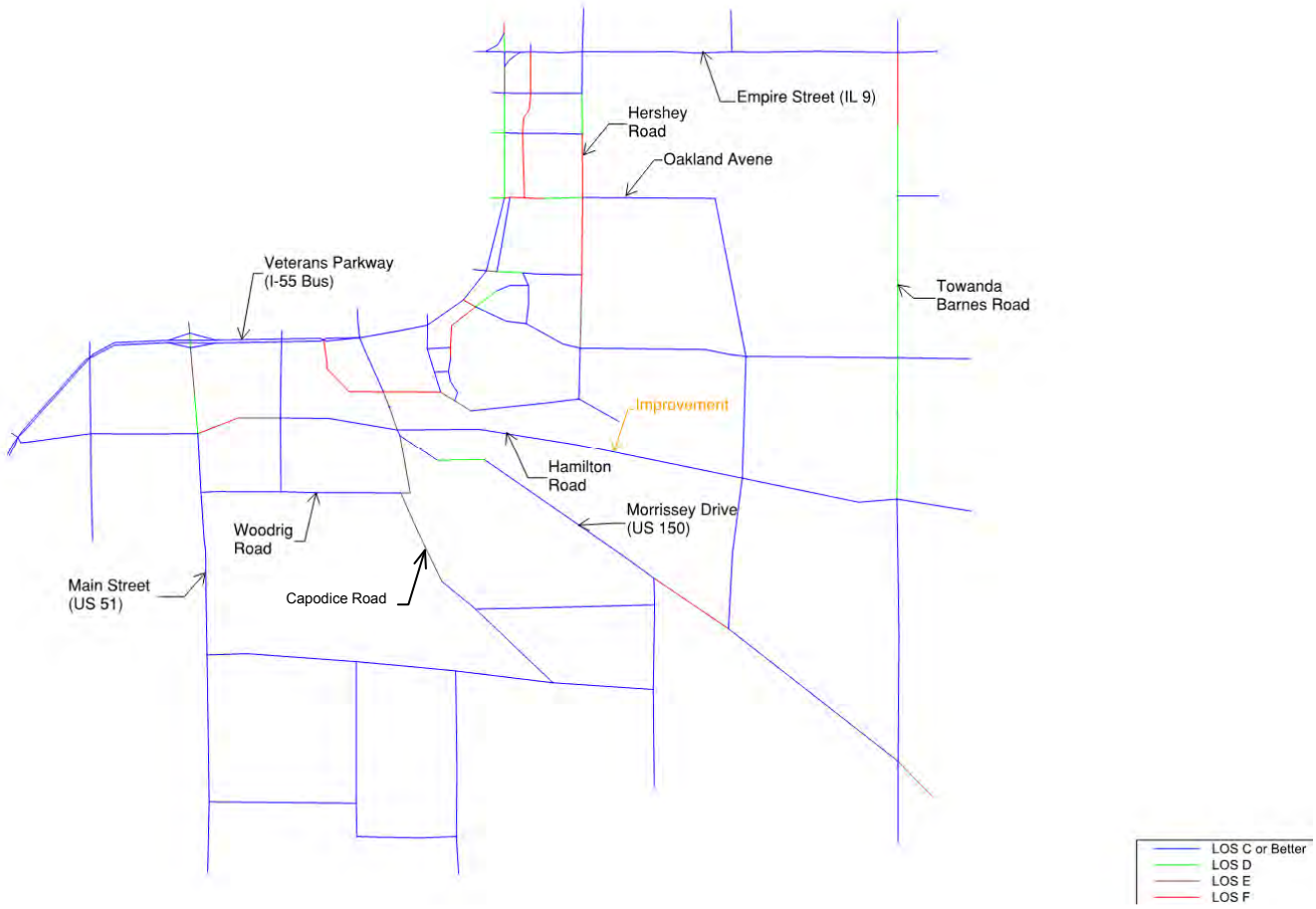
For the 2035 condition, the roadway segment Level of Service (LOS) has been calculated for all street segments. A level-of-service (LOS) is a grading system whereby the quality of operation on a street system can be identified. LOS's range from an "A", the best traffic operation, to "F", the poorest. The LOS for roadways can be based on a ratio of the volume to total capacity (v/c) for a 24 hour period. It

is generally accepted that for urbanized areas the minimum acceptable LOS is Level D. Table 3.6.4 describes LOS and the relationship to v/c ratio. For the purposes of analyzing this alternative, the LOS for streets in the study area are identified in Figure 3.6.3.

Table 3.6.4 - LOS Description

LOS	*Description*	*Volume to Capacity Ratio*
A	Free flowing traffic	< 0.50
B	Low-density stable traffic	0.51 – 0.70
C	Medium density stable traffic flow	0.71-0.80
D	High density stable traffic flow	0.81-0.90
E	Unstable flow at or near capacity levels	0.91-1.0
F	Breakdown of traffic flow	> 1.0

Figure 3.6.3 – Street LOS



3.6.4 Travel Demand Model Findings

Using Table 3.6.3 and Figure 3.6.3, the following conclusions can be made regarding traffic patterns and operations caused by implementing Alternative #6 (Hamilton Road: Rhodes Lane Alignment):

- The service life of Hamilton Road (Main to Bunn), Morrissey Drive (south of Woodrig), Ireland Grove Road, and Towanda Barnes Road (North of Ireland Grove Road) Veterans Parkway (I-55 Bus), Ireland Grove Road, is extended by approximately 10%-15%.
- Hamilton Road (Rhodes Lane Alignment) is constructed closer to Morrissey Drive than Alternative #4 – Hamilton Road (Hershey to Towanda Barnes), and therefore, relieves congestion on Morrissey Drive more than Alternative #4 – Hamilton Road (Hershey to Towanda Barnes.
- Hamilton Road, between Main Street (US 51) and Hershey Road provides a much needed east-west arterial roadway evident by the roadway reaching the calculated capacity within the planning horizon (2035).
- Traffic volumes on Hamilton Road (Rhodes Lane Alignment) are expected to be 40% less than traffic volumes on Alternative #4 – Hamilton Road (Hershey to Towanda Barnes). This difference in traffic volumes on similar alignments is likely because Alternative #4 – Hamilton Road (Hershey to Towanda Barnes) provides a much more direct route and less congested route to State Farm, commercial destinations, and Veterans Parkway. Therefore, it is recommended to not carry this alignment forward.
- Constructing Hamilton Road (Rhodes Lane Alignment) should be accompanied by improvements to Abraham Road. This is evident because the north-south connection between Morrissey Drive and Hamilton Road east of Towanda Barnes is shown to operate at LOS C; however, the expected ADT is approximately 9,000. Existing Abraham Road is a township road that is not designed to handle high traffic volumes. Without the Abraham Road connection, this alternative would not change travel patterns as significantly as shown above.
- Woodrig Road and Capodice Road see dramatic increases in traffic volumes because land development to the south and west use these roadways to reach Morrissey Drive and Hamilton Road (east of Morrissey Drive) since Hamilton Road (east of Main Street) and Main Street are reaching capacity. These roadways will likely need to be reconstructed to accommodate the trips if this land development occurs.

3.6.5 Travel Time Benefit-Cost Analysis

Because travel time changes based on the improvement constructed, a benefit-cost ratio was calculated for Alternative #6 (Hamilton: Rhodes Lane Alignment). A breakdown of the costs for Alternative #6 is shown in Table 3.6.5. These costs result in the benefit-cost ratio shown in Table 3.6.6.

Table 3.6.5 – Alternative #6 (Hamilton: Rhodes Lane Alignment) Opinion of Probable Cost

Item	Opinion of Probable Cost
Construction	$33,750,000
Right-of-Way	$1,500,000
Engineering	$6,750,000
TOTAL	**$42,000,000**

Table 3.6.6 - Travel Time Benefit-Cost Ratio

	Benefit	Cost	Benefit/Cost
Alternative #6	$2,015,554,917	$42,000,000	47.99

The following steps were used to estimate the cost to construct Alternative #6.

- The length of the roadway proposed (22,500 ft.) to be constructed was multiplied by the number of travel lanes required for adequate capacity by the TDM ADT estimates. In this case, the improvement is a 3 lane section for an ADT under 14,000.
- A unit cost of $500/foot/lane was multiplied by the previous product.
- The cost of right-of-way needed for the project is $60,000 per acre in urban areas and $20,000 per acre for rural areas. This alternative will require acquisition of approximately 52 acres; 75% of which was in a rural area.
- The cost of design and construction engineering was assumed to be 20% of the construction cost.

The following steps were used to calculate the travel time benefit per year for each alternative.

- The TDM calculated the time it takes to travel to and from each external station in the study area for the 2035 socioeconomic condition (Table 3.6.1).
- The calculated travel time for the alternative was subtracted from the calculated Existing 2035 travel time (Table 3.6.1).
- The difference in travel time was then multiplied by the ADT across the busiest link in the 2035 No Build alternative (71,480) and 365 days per year.
- An average wage of $10/hour was multiplied by the previous product.

4. Recommendations

Using the information provided throughout Section 3 of the report, capital funding for proposed infrastructure projects can be objectively prioritized in the following manner:

- **Alternative #3 – Hershey Road (Morrissey to Hamilton) without a grade separation should be give first priority in the study area because**:

- This improvement has a travel time benefit-cost ratio that is approximately three times higher than any other improvement, and therefore, provides the most benefit to the existing system.
- This improvement provides significant congestion relief to Morrissey Drive north of Hamilton Road and to Hamilton Road west of State Farm Corporate South Campus (See Table 3.3.3),
- The improvement decreases the projected Average Daily Traffic on an already failing Hershey Road (North of Ireland Grove Road) by approximately 20%,
- The improvement would provide a significant life safety benefit for emergency response, and
- Given that Table 3.3.2 shows no benefit to travel time estimates from constructing a grade separation and Table 3.3.1 provides a benefit-cost ratio of less than one, it is recommended that a grade separation is not constructed with this alternative.

- **Alternative #1 – Hamilton Road (Bunn to Commerce) without a grade separation should be given second highest priority in the study area because**:
  - This improvement has a travel time benefit-cost ratio that is higher than all other alternative studied, other than the Alternative #3 – Hershey Road (Morrissey to Hamilton), and therefore, provides the second most benefit to the existing system.
  - The service life of Veterans Parkway (I-55 Bus), Ireland Grove Road, and Empire Street (IL 9) are extended by approximately 10% (See Table 3.1.3), and
  - Hamilton Road, between Main Street (US 51) and Hershey Road provides a much needed east-west arterial roadway evident by the roadway reaching the calculated capacity within the planning horizon (2035).
  - The improvement decreases the projected Average Daily Traffic on an already failing Hershey Road (North of Ireland Grove Road) by approximately 20%, and
  - Given that Table 3.1.2 shows no benefit to travel time estimates from constructing a grade separation and Table 3.1.1 provides a benefit-cost ratio of less than one, it is recommended that a grade separation is not constructed with this alternative.

- **Alternative #4 – Hamilton Road (Hershey to Towanda Barnes) without a grade separation should be given third highest priority in the study area because:**
  - Extending Hamilton Road from Hershey Road to Towanda Barnes Road significantly changes travel patterns by allowing direct access to State Farm (and other commercial destinations) from the south and east. This is evident by the significant improvement in level of service on Hamilton Road and Morrissey Drive north and west of the Hershey. Hamilton and Morrissey are no longer expected to fail if the Hamilton Road extension is constructed (See Figure 3.4.3)
  - The service life of Ireland Grove Road is expected to be extended by approximately 22% (See Table 3.4.3).
  - Service life extensions between 10% and 20% are expected on portions of Hamilton Road west of Loop Road, Morrissey Drive (US 150), Empire Street (IL 9), Towanda Barnes Road south of Ireland Grove Road, and Veterans Parkway (I-55 Bus) west of Morrissey Drive (See Table 3.4.3).

  - Alternative #1 - Hamilton Road (Bunn to Commerce) is recommended as the second priority, constructing this improvement instead of Alternative #6 – Hamilton Road (Rhodes Lane Alignment) creates a continuous east-west arterial roadway with direct access to State Farm.
  - Given that Table 3.4.2 shows no benefit to travel time estimates from constructing a grade separation and Table 3.4.1 provides a benefit-cost ratio of less than one, it is recommended that a grade separation is not constructed with this alternative.

- Traffic volumes on Hamilton Road (Rhodes Lane Alignment) are expected to be 40% less than traffic volumes on Alternative #4 – Hamilton Road (Hershey to Towanda Barnes). This difference in traffic volumes on similar alignments is likely because Alternative #4 – Hamilton Road (Hershey to Towanda Barnes) provides a much more direct route and less congested route to State Farm, commercial destinations, and Veterans Parkway. **Therefore, it is recommended to not carry Alternative #6 – Hamilton Road (Rhodes Lane Alignment) forward.**

- **Constructing Alternative #2 – Morrissey Drive (US 150) Grade Separation should be eliminated from funding consideration as it provides very little benefit to congestion relief and safety throughout the study area transportation network.**

- **Constructing Alternative #5 – Towanda Barnes Grade Separation should be eliminated from funding consideration as it provides very little benefit to congestion relief and safety throughout the study area transportation network.**